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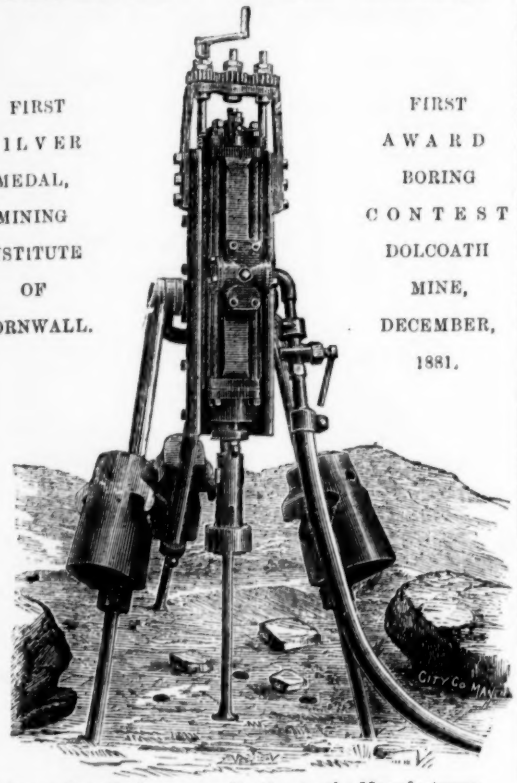

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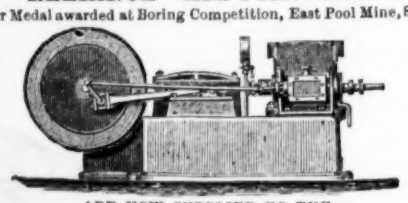

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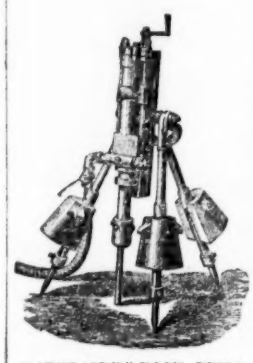

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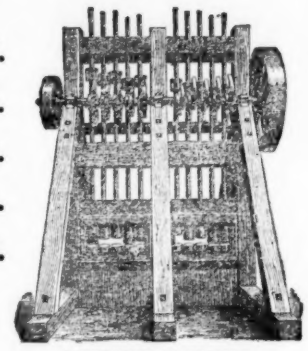

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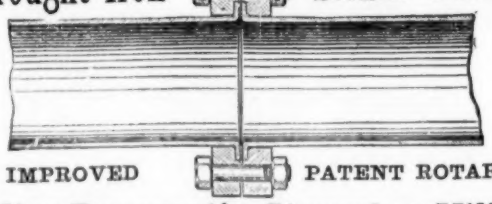

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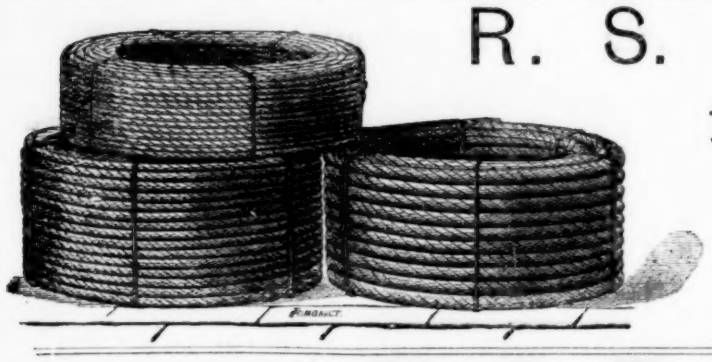

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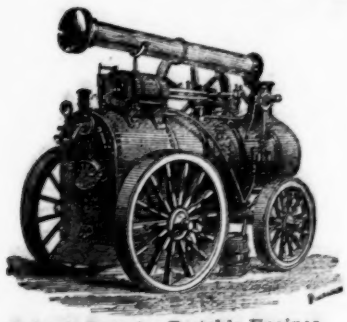

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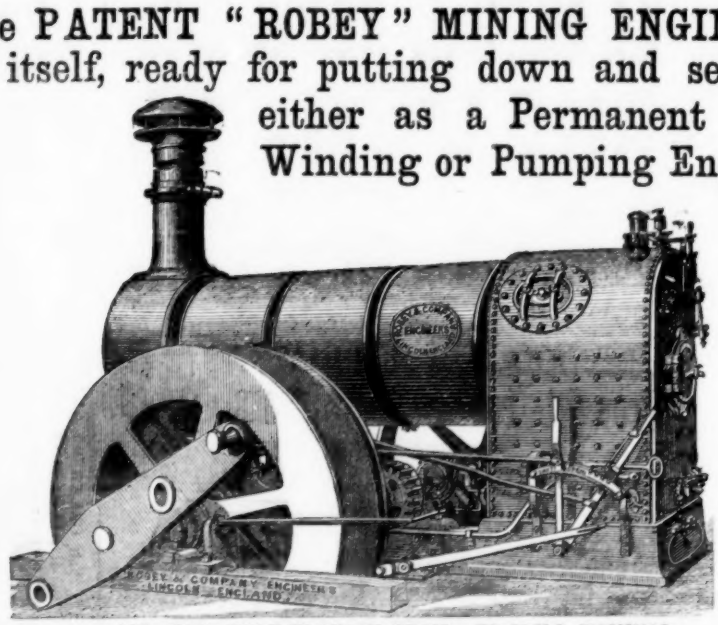

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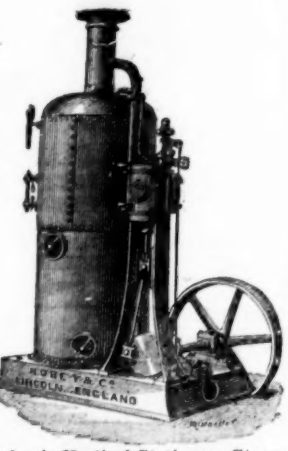

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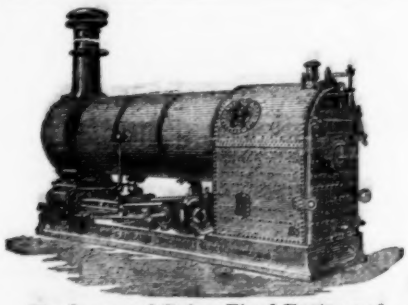

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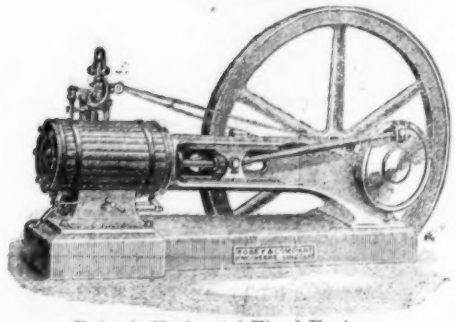

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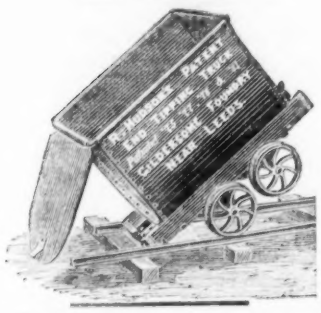
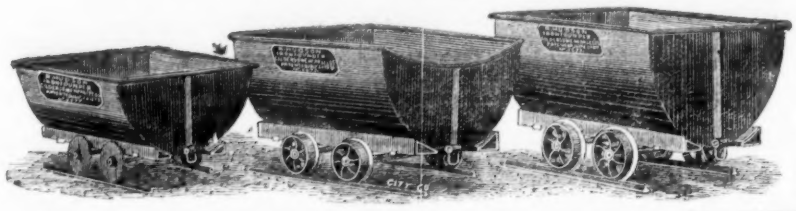
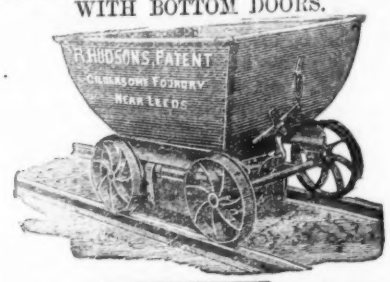


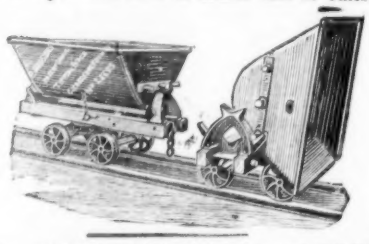
7.—PATENT STEEL MINING WAGONS.



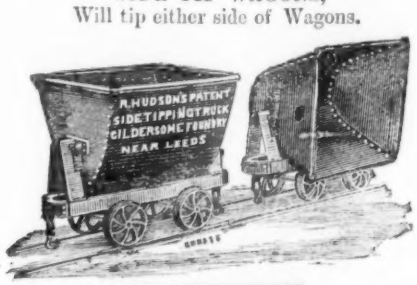
12.—PATENT STEEL HOPPER WAGON, WITH BOTTOM DOORS.



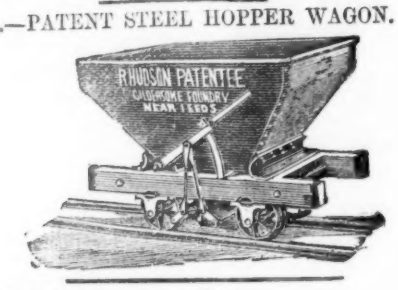
2. PATENT UNIVERSAL TRIPLE-CENTRE STEEL TIPPING TRUCK,
Will tip either SIDE or either END of rails.



8.—PATENT DOUBLE-CENTRE STEEL SIDE TIP WAGONS,
Will tip either side of Wagons.

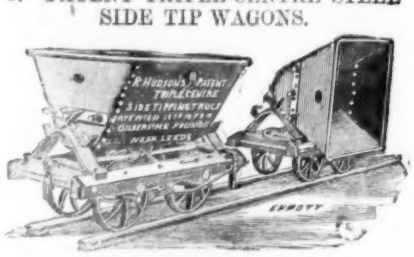


13.—PATENT STEEL HOPPER WAGON.

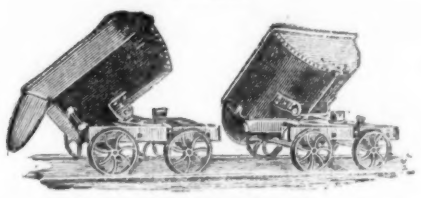


ONE man can EASILY tip ANY WEIGHT in these wagons.

3.—PATENT TRIPLE-CENTRE STEEL SIDE TIP WAGONS.

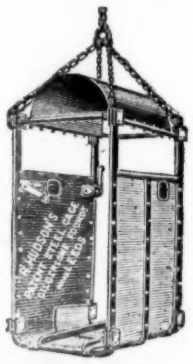


9.—PATENT STEEL ALL-ROUND TIP WAGON.



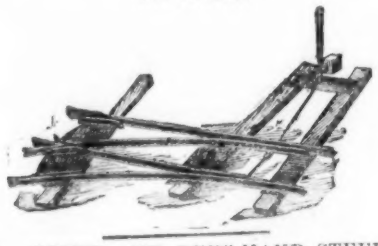
14.—SELF-RIGHTING STEEL TIP BUCKET.
(The "CATCH" can also be made SELF-ACTING if desired.)

15.—STEEL CAGE.



4.—PATENT STEEL PLATFORM OR SUGAR CANE WAGON.

10.—LEFT-HAND STEEL POINT AND CROSSING.



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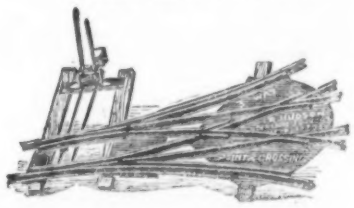

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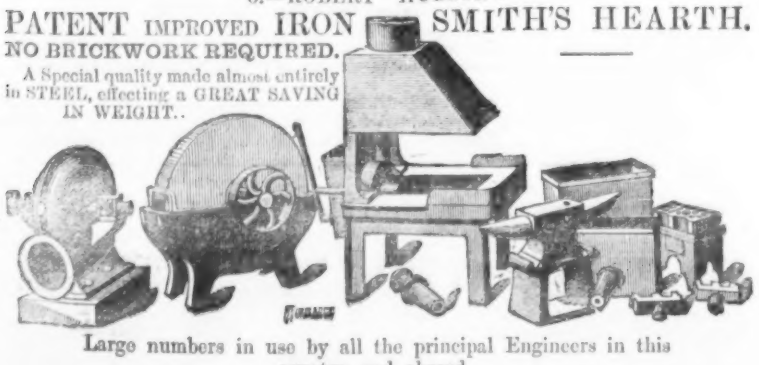

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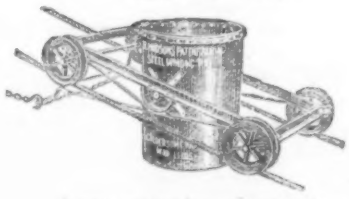

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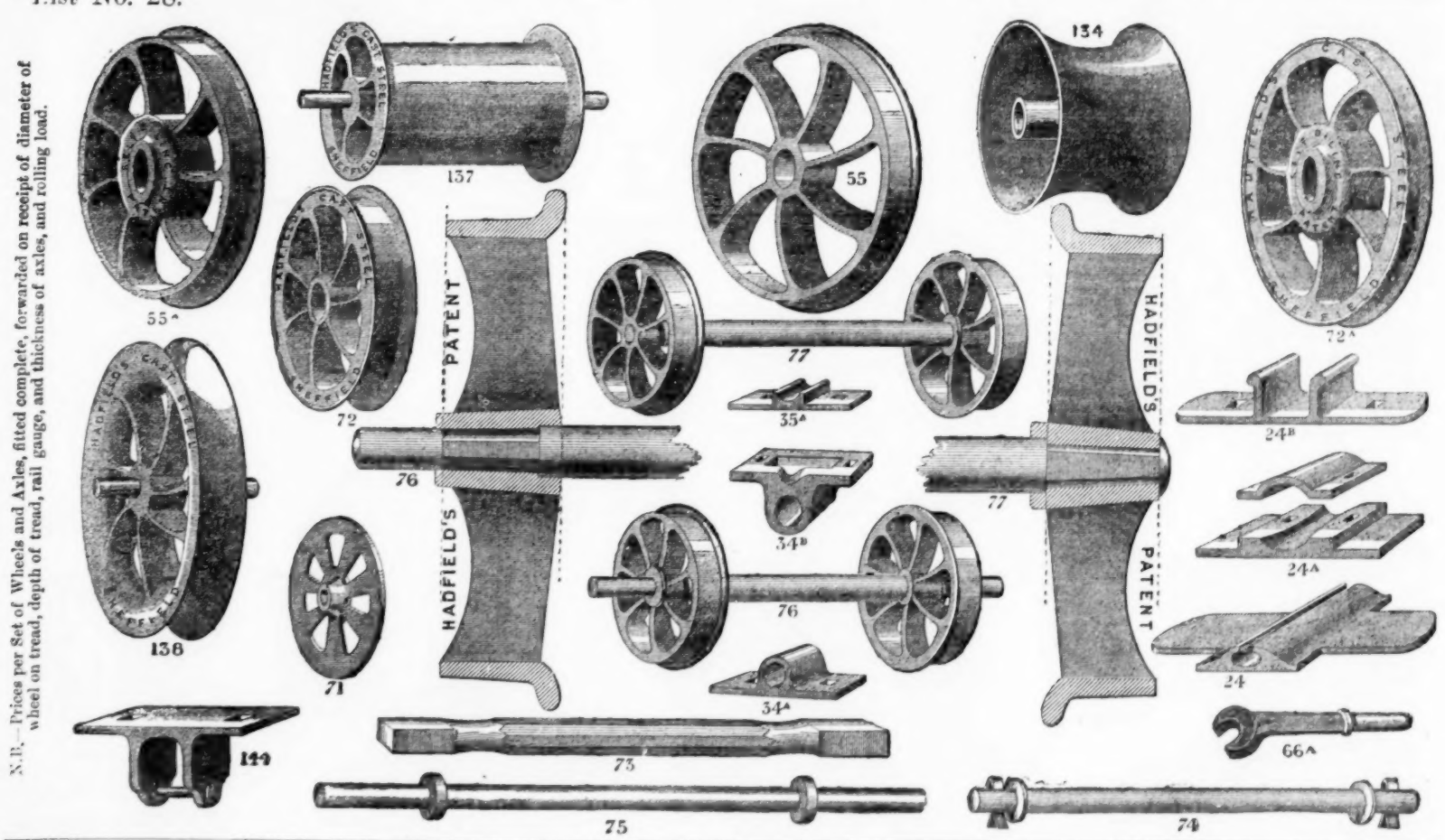
In addition to the now universally admitted superiority of Hadfield's steel wheels over those of cast-iron for lightness, strength, and wearing qualities, we claim the following SPECIALITIES for our material over any other steel, malleable iron, or other wheels, viz.:—

Extra TOUGHNESS or TENACITY, DURABILITY, and SOLIDITY: for proof of this kindly see advertisement marked "List No. 28."



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Rollers, Pulleys, Frames, and Stands.—See our lists of over 240 different patterns. They possess great durability, lightness, and strength, and add considerably to the life of the steel or other ropes.

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HADFIELD'S STEEL FOUNDRY COMPANY, HECLA WORKS, ATTERCLIFFE, SHEFFIELD.

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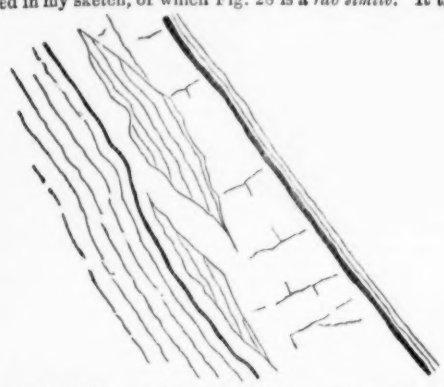
Original Correspondence.

THE GOLDEN QUARTZ REEFS OF AUSTRALIA.—No. X.

SIR,—Garden Gully Line of Reef, Specimen Hill, Eaglehawk.—During a visit to the Eagle Company's mine, on this hill, on Sept. 19, 1867, I made a sketch in my note-book of the reef, as it occurred in the top of the stope, at 170 ft. in depth on the underlie, showing enclosures of slate in the reef. The quartz reef (Eagle) underlies east 4 ft. 6 in. in 6 ft., and was 4 ft. in width at the thickest part embraced in my sketch, of which Fig. 28 is a *fac simile*. It takes in



about 10 ft. in height of the reef. The footwall marginal line of the reef consisted of what our miners call "ironstone casing"—*i.e.*, slate altered into a clayey ironstone by ferruginous water saturating it, which water had percolated from the surface through the quartz reef, absorbing iron from the decomposing pyrites during its passage to the water level in the reef. The parallel lines further into the footwall represent layers of slightly different coloured slates, that run parallel to the casing. The ironstone casing of the hanging-wall is also formed in the same manner. It varied from 4 in. in thickness at the top of the sketch to 3 in. in the lower portion; overlying it were two layers of slate, their bedding planes lying parallel with the casing, and they were each 3 in. in. width. Then came sandstone, which usually forms the permanent hanging-wall of reefs on this Bendigo gold field. The lines at nearly right angles to the walls of the reef, indicate the direction in which the quartz divides into blocks, when it shrinks through the water level falling. These horizontal lines, and those—in a lesser degree—at nearly right angles to them, are commonly more or less filled with clay or with deposits of limonite (brown iron ore).

Some of these joints in the upper parts of many reefs contain this ore 1 in. or more in thickness, which form a coating on the blocks of quartz, to which it adheres very strongly. The reduction of the water level in reefs above mentioned is due to the water flowing in the creeks and gulleys cutting deeper into their beds (like water saws), and thus draining the reefs, gradually but persistently, to greater depth, and causing the quartz to slowly dry and divide whilst shrinking into more or less rectangular blocks of varying sizes. Many quartz reefs, through the phenomenon just described, present near the surface a remarkable resemblance to an artificially built stone wall, the clay and ironstone representing mortar. The stones obtained from a reef of this description requires to be broken in order to discover whether they are or are not auriferous. When such stones are fractured an observer can trace very frequently the evidence of the original banded or laminated character of the reef by means of the cavities left through the decomposition and washing out of the clay-slates and sulphides that once lodged therein, when this portion of the reef existed beneath the water level in the reef. I use this word existed advisedly, for, as I have probably said before, I can only look on those portions of reefs, or lodes, or veins that lie above the naturally permanent level of water in them, as dead, decomposing, and undergoing permanent destruction. But to return to my section, No. 28, it was observed that the reef was richest where the slate accompanied it along the stope, at that time open for 100 ft. in length. With regard to the two large enclosures of slate in the reef and on its footwall side, I paid particular attention to the direction of the bedding planes in them, and found them to be almost identical with those of the bedding planes of the main body of slate in the footwall. You will observe my original sketch was made 17 years since, and I have examined innumerable specimens and reefs since then, containing enclosures of slate, and I have invariably found the enclosed slate had bedding planes parallel with the nearest wall. A good specimen from a reef should have attached to it a portion of at least one wall, The bedding planes are most perceptible and distinct in slate from above the water level, as that from below is pretty much all one colour, and the cleavage lines are deceptive. Care in making such observations must also be taken that the ferruginous water stains spreading out from the reef, above the water level in beautiful parallelism, are not mistaken for bedding planes, which to the superficial observer they so strongly resemble, as to apparently render careful examination unnecessary. The lines shown in the footwall of the reef (Fig. 28) and in the enclosed pieces of slate in the reef represent the bedding planes of the slate.

The last report from the Specimen Hill United Mine reports operations being carried on at several levels down to the 520 ft. cross-cut, and that during the past fortnight 90 tons of quartz have been crushed for a yield of 228 ozs. 3 dwts. of gold, and they declared a dividend of 1000*l*. Proceeding still further north on this line of reef up to the Argus Company's mine a considerable quantity of gold has been raised from time to time. The shareholders in the latter mine received in dividends some 14 years since more than the capital of the company—20,000*l*.—on a very small amount called up. Just after the 31st dividend was declared at the beginning of the month of June, 1870, a large specimen or nugget of gold was discovered at 320 ft. in depth, which weighed in the gross 288 ozs., of which 108 ozs. consisted of quartz, pyrites, and a little galena, and the balance, or 180 ozs., was gold. The line of reef about here is famed for yielding rich specimens; but this is the biggest—6 in. by 4 in., and the most valuable yet found. Many nuggets, however, larger than this one have been found at considerable depths in quartz reefs in Victoria from time to time, which I shall probably refer to in their proper places in future remarks on quartz reefs in other gold fields. Sufficient nuggets have thus been found to render it unnecessary that anyone should further waste time and labour over theories for the formation of large gold nuggets in alluvial deposits. The line of reef as it runs north of the Argus merges into the Clarence, also rich, and then into the Moon Reef which runs away north for a long distance, mine after mine, some of which have given fair yields of gold; but none of them exceptionally rich. The quartz occurs in large reefs about 60 ft. wide and less. At length I have reached the northern extremity of this great line of reef—so far as developed to any noticeable extent at the present time. Reefs have been, and are, in work for a long distance beyond, and apparently in the line of this great reef; but they are not continuous or of sufficient importance to be worthy of notice now. I have given a few descriptive notes of the most important mines on this reef for a length of about 7 miles, throughout the whole of which distance auriferous reefs have been worked with only two breaks or spots of very short lengths, which have not yet been proved gold-bearing. This may probably be explained by these blanks lying just under the top formations of quartz, and in the thinning out of the next, and not being deep enough to catch the third reefs. I have lopped off about 3 miles on the continuation of this Great Garden Gully Reef line as not at present worthy of note. Seven miles of it I have, however, referred to at perhaps too great a length and too much in detail for the patience of your readers, Mr. Editor, and I must ask their pardons. The subject, I know, runs away with me sometimes, and gets the better of my judgment of what not to say. I take leave of this reef by remarking that the deepest shaft on it at present is that owned by the Victory and Pandora Company, which is now 1907 ft. wide, and being sunk at the rate of 7 ft. a week.

In the past history of this Great Bendigo gold field, since quartz mining became important, it has been characterised by one of the three great lines of reefs, completely overshadowing the others for a term of years. First, it is the Victoria and New Chain, or western line of reefs, that yields up its treasure in such quantities as to eclipse the others; then after a dull time comes the Hustler's, or eastern line, with a rush, and then immediately follows the Garden Gully, or central line of reef. The Hustler's becoming more and more lost in the shade, but deeper mining being still persisted in will no doubt be rewarded richly in good time in the future. The Garden Gully has been following suit for some time, and it is steadily dropping into the shade, whilst just as surely has the Great Western line of reef been for the past four or five years again emerging into the broad sunshine of prosperity and riches. It is best that such should be the case, as it prevents the wild excitement of these great reef lines producing an abundance of wealth at any one time or period, to be followed by the extreme of dulness and call paying after a surfeit of dividends and extravagances. More than one whirlwind of prosperity has been witnessed on Bendigo or Quartzopolis, as it has at such times been christened, but the inevitable collapse followed, and the effect has been injurious to the mines, the residents, and the city. WM NICHOLAS, F.G.S.,

Melbourne, Nov. 24. Consulting Mining Engineer.

AUSTRALIAN QUARTZ REEFS—THE GOLD FIELDS OF NORWAY.

SIR,—In the *Mining Journal* of Aug. 30 I observe a letter signed "Joe Baddeley," headed the "Gold Fields of Norway," asking that I would give the old names of claims as well as the new in my "Golden Quartz Reefs of Australia," so that the several points may be identified by "old chums" who worked on the gold fields here in the early days of gold mining, and left Australia soon after. I will try and satisfy Mr. Baddeley on these and other matters that he refers to in my future papers on the above subject. May I, in turn, ask Mr. Baddeley to oblige me, and, no doubt, many others of your readers, to give a concise description of the modes of occurrence of auriferous quartz veins in the part of Norway in which he resides, and say whether the slate and other rocks in the footwall and hanging-wall of the veins or reefs run parallel with the reefs, and if the reefs enclose pieces of the walls, and which wall; also what each wall is formed of—*i.e.*, which rock, and the relative hardness of these rocks, angle of underlie of the reefs, &c.? Any other information, such as mineral contents of the reefs and rocks, &c., will be interesting.

The lower silurian strata of Norway resembles in many respects those in Victoria, judging from the description of several geologists who visited Norway long since, and this similarity I directed attention to in one of my public lectures delivered at the School of Mines, Bendigo, on Aug. 5, 1881. In both countries the strata lie in granite basins, and they have—*i.e.*, the strata—been altered into crystalline rocks. One point more of some importance I should like to get some information about, and that is whether or not the lower silurian strata in Norway are corrugated, and, if so, to what extent. For instance, say, in 2 miles across the strike, or bearing of the strata, how often does the strata form an anticlinal or arch at the surface. I noted some time since remarks in your Journal, Sir, stating that the slate in the Oscar Mining Company was considerably auriferous. This, I need not say, considerably interested me, as this is frequently the case in Australia in both upper and lower silurian. Only last week, whilst I was at the Union Company's mine at Amherst (old Daisy flat and hill) Mr. B., the manager told me he frequently saw rich gold quite 6 in. away from the reef, and in black slate, rather hard. As this shoot of gold in this mine is rich and peculiar I hope to give a short description of it in your Journal, Mr. Editor, in the future. The mine is on the Church Hill reef, but possibly a church did not exist when Mr. Baddeley was at the Daisy Flat rush.—*Melbourne Nov.* 24. WM. NICHOLAS, F.G.S.

MINERAL RESOURCES OF NEVADA—WHITE PINE DISTRICT.

SIR,—Happily, on the Pacific coast stampedes to new mining localities are not so frequent as they once were. Many will remember the rush to White Pine in 1868 and 1869. Nearly the entire Pacific States and Territories were for a time worked up into a perfect furore of wild excitement. Not much wonder; fortunes were made in a day; in many cases as suddenly lost at the gambling tables of Hamilton and Treasure City, or staked as recklessly at the stock boards of San Francisco. Without the aid of hoisting works or other costly machinery, millions were soon unearthed within a few feet from the surface. In a district 8 miles by 6, several towns quickly sprang into existence. Hotels, saloons without number, banks, business houses, newspapers and like accompaniments as rapidly followed to supply the wants or gratify the tastes of the eager, bustling crowds flocking into the camps in all ways and from all quarters. In a very short time the population swelled to the number of 35,000.

The South Aurora and the Eberhardt, two of the most famous mines at that day, are said to have yielded not less than $10,000,000. One ore chamber of 750 tons of the Eberhardt averaged more than $2000 per ton, with a gross product of one and a half millions in silver. The entire bullion shipment from White Pine district to date, inclusive of base metal, is set down from the best sources here at about $15,000,000, the two mines above named being credited with the largest share of that amount. Such is a brief account of the early history of the camp, by way of introduction to some details in regard to its present condition and prospects. It is not necessary to more than allude to the long years of weary waiting and hoping that in the meantime intervened, as a much more cheerful feeling seems to prevail the entire community at present, with a very encouraging outlook for the future.

The Eberhardt Company of London, their property consisting of the Eberhardt and North Aurora Mines, situated on Treasure Hill, where so much rich ore was found within 200 ft. of the surface, the conclusion was very naturally arrived at, that more of the same sort should be reached at a greater depth. As early as July, 1876, the company commenced a tunnel at Eberhardt, on the southern base of the hill, since which time the work has been continuously driven. The tunnel proper is 6000 ft. in length, reaching a vertical depth of 1600 ft., the inner terminus being connected with the surface by an incline of 2100 ft., that passes through the North Aurora ground. From the foot of this incline a drift has been run west 1200 ft., intersecting a lode that has been followed north and south a total of 2000 ft. To sum up in brief, including tunnels, drifts, upraises above tunnel level, winzes below it, the length of the work is put down as fully 4 miles in the aggregate. A large amount of ground remains to be explored. Although no large deposits of ore have been discovered, several hundred tons of a good milling quality have been encountered—sufficient to demonstrate the fact that the ores of the hill extend to a great depth, contrary to the former theory that they were confined to potholes or chambers near the surface. The company are still pushing the work with air-drills under the prudent management of Mr. F. Drake, of Eberhardt, with hopeful prospects, to say the least, of seeing their efforts eventually crowned with success.

Hamilton, the county seat of White Pine county, is situated at the north end of Treasure Hill. There was quite a revival here the past summer in mining matters, owing mainly to the influx of capital from abroad, and the discovery of what promises to be a large and rich ore body, is one of the claims of the Sweetwater Mining Company. They have been operating here for the past two seasons with good results, and are understood to be well provided financially to mine on a large scale, and to the best advantage. Mr. C. W. Havemeyer, of the Havemeyer Sugar Refinery, of New York, is president of the company; and Mr. Eugene N. Robinson, well known in Wall-street circles, New York, is the largest stockholder and managing director. They have 14 locations, all told—the Sweetwater proper, the Kerr, the Original Hidden Treasure, the Keystone, the Baldy Sam (between the Eberhardt and Aurora South), the Drew, the Stafford, Fisher's Point, Turkey, Baldy Sweet, Mammoth, Hidden Treasure No. 2, the Bruce, and the Irene.

The most important work is given at present to the Stafford and Original Hidden Treasure. Both noted mines of the district, the latter for its richness in the past, being put down for $1,500,000, the former, for the bonanza which it promises to show up the ensuing winter, if it should hold out in the ratio of recent as well as present indications. The outlook at any rate is represented to be exceedingly encouraging. It is understood that upwards of $100,000 in silver were taken from the Stafford years ago. The ledge is reported fully 30 ft. wide, and the best defined of any in this vicinity, with good foot and hanging walls, and an 8-ft. dyke of spar lying next to the footwall. The ore ranges from $55 to $60 per ton.

The Wheeler tunnel has already been run 900 ft. towards the Original Hidden Treasure, and a new contract has been let to drive it 413 ft. further, which will take it through the ground. The ore from this mine runs all the way from $25 to $1000 per ton. The yield from these two mines to late owners since the summer of 1883 has amounted to $73,350, the first fruits only of what is believed to be the sign of an abundant harvest by another season. The rock is a free milling silver-bearing ore, with a mere trace of gold, and is reduced at the company's 20-stamp mill at Hamilton. The average yield at this writing is about $360 per ton. A number of bars seen at the office were marked from 920 to 998 fine, and one as high as 999½, coming as near pure silver as they are ever made. It is the intention of the company to erect leaching works next spring, with a capacity of from 30 to 50 tons per day. By this process it is anticipated that a much larger per cent. of silver will be saved, and ores of a much lower grade be worked at a profit. The same parties own the King Mine and furnace, and also the Ward Beecher Consolidated, better known, perhaps, as the Edgar Mine, which has produced about 20,000 tons of ore of the average value of $35 per ton, or not far from $700,000. It has been developed to the depth of 300 ft., with from 5000 to 10,000 tons in sight of free milling chloride ore, estimated to work $80 per ton. The same company, Mr. J. R. Kendall, superintendent, also own the Manhattan mill of 24 stamps, 16 pans, and other usual appliances. Their water privileges are said to be by far the finest in the district. The mill has been running on tailings for the past six weeks, during which time they have shipped nine bars of bullion, averaging 995 fine, and valued at about $10,000. About 10,000 tons of tailings remain on the ground to be worked, which will give a handsome net profit to the company. In this connection it may be well to state that the Consolidated Treasure, also under the management of Mr. Kendall and Mr. J. P. Stevens, of New York, president, has reached a depth of 115 ft., with ore of the same grade and character as that of the Edgar.

The Jennie A. and Black Rock, of which Mr. F. Cutting, of your city, is president and chief owner, and Mr. J. R. Kendall, managing director at Hamilton. The rock is of the base metal order, averaging 43 per cent. in lead and $40 per ton in silver—carrying some gold. The vein is a contact of quartzite and limestone, similar as to ore and formation to the celebrated Richmond Mine at Eureka. About 10,000 tons are in sight, and the company are now running an adit level to strike the vein on the dip at the depth of 1000 ft., vertical. The Silver Chamber adjoins the Caroline, from which nearly $50,000 were taken as early as 1870. It is found in good company, although only a small vein from 1 in. to 19 in. in width. The rock is said to be rich. A few men are now extracting ore with the view to ship, thought to bring them $300 per ton. The Silver Wave, lying immediately south of the original Hidden Treasure—a good locality—is represented to have an immense body of low-grade ore that will average $30 per ton. Its character is principally a free chloride, with some bromide and horn silver, and some of it closely selected has milled up into the thousands.

The Hope Mine, now owned by Matthewson and Co., of Hamilton, has been worked more or less for 12 years. During the first three it turned out in the neighbourhood of $65,000, when most of the ore in sight was exhausted. The present prospect is represented as exceedingly flattering, the indications pointing strongly to the speedy opening up of another large ore body. The Chief, belonging to Messrs. Reilly and Gilmer, is located on the north side of Treasure Hill. It is opened by a tunnel 300 ft. in length, and one shaft to a depth of 180 ft., showing an 80-ft. ledge, that will work by mill process up to $35, on an average. It is thought here that with good leaching works on the ground the whole of this large deposit could be made to pay. The Continental Con., comprising the C. O. D. and the Fay, at present worked on tribute—a base one—works as high as $130 per ton for first class. The White Pine Belcher, owned by A. Jacobson, is looking well: 100 tons shipped to Eureka worked up to $120 per ton.

The Imperial and Oh Joe, together with the Reindeer, Congress, Western Central, Maryland, Eureka, Compensation, and Good Luck are the property of Hon. Thomas Wren, of Eureka. It is understood that a large amount has been expended in the past in the way of development of these claims. The Imperial and Oh Joe are the only mines of the group at present worked. The greatest depth attained is about 60 ft. The ore is of the smelting order, running from 7 to 10 per cent. in copper, about 30 per cent. in lead, and averaging $80 per ton in silver. So much for the White Pine proper. On the whole, the prospect for lively times looks favourable. Notes of Ward, Taylor, and some other districts of White Pine county are reserved for another letter.—*Hamilton, Nevada.* A. C. K.

—*In San Francisco Mining and Scientific Press.*

IRONMAKING IN AUSTRALIA.

SIR,—We have long been able to congratulate ourselves on being independent of everyone for coal, and I hope the time is not far distant when we shall be able to make the same claim with regard to iron and steel; you will, therefore, I am sure, permit me to refer to an interesting series of articles on the subject published in the Sydney Daily Telegraph. After carefully enforcing the importance of the question, and alluding hopefully to the call of the New South Wales Government for tenders to supply 150,000 tons of steel rails made from native materials, the writer admits that several attempts had been made from time to time to turn their ores into marketable iron, and many thousands of pounds had been spent in these trials. They had taught one valuable lesson, at least, which must never be lost sight of—that the old plan of reducing ironstone in the blast-furnace is not applicable to the ironstone of Australia. Unless some means could be found to prevent ores from forming spongy iron, clinging to the sides of the furnace, and eventually choking it, it was better to abandon all idea of iron smelting, and turn attention seriously to working them in such a manner that their peculiar nature could be made to subserve the necessities of the colonists. The writer continues:—Since reduction of our ores by means of the blast-furnace is an economical impossibility, we must turn our attention to some method of "direct" reduction—some method by which a metal chemically pure may be produced directly from the ore. In this direction seems to lie our only sure hope of success, and this must be the guiding star of all future efforts. The Bessemer process, especially as improved by Gilchrist, Thomas, and Snelus is a grand and economical one, although its initial cost is extremely heavy, but it does not deal with the ore in a direct manner.

Fortunately for the country's future, a process has been invented, perfected, and patented by a skilled metallurgist, who has spent many years in the Australian colonies, and devoted himself to a study of this question. This gentleman commenced his enquiries and experiments by investigating the reasons for the peculiar behaviour of our iron in the blast-furnace, and, having discovered it, set to work to devise a means to separate the metal from its matrix without trying to liquefy it, since that was found to be impracticable. For this purpose he invented a furnace, new in principle and simple in construction, and has practically demonstrated the possibility of reducing our hitherto unworkable ores in an easy and economical manner. This should mark an epoch in our industrial history, as the discovery of Thomas and Gilchrist, which rendered the phosphoric Cleveland iron workable in the Bessemer converter, did in that of England. Here, then, we have a great want supplied, and the blast-

furnace rendered unnecessary, so that the primary cause of past failures is at length removed. What, then, remains but to pursue the path indicated by science and reason, casting aside all vain thoughts of working according to the methods of other countries, and, adapting our means to our end, make an earnest effort to supply our own needs out of our own resources. Probably many may imagine that to lay down an iron and steel works would require an almost fabulous amount of money. This is not so, however, for land is far less expensive here than in other countries; timber is plentiful, and to be had for the felling on the land acquired, most of the large quantities of machinery requisite could perfectly well be made here, and minerals such as are necessary can easily be obtained at a low cost. Labour certainly would be a far heavier item than it is in England in the present depressed condition of the trade, but this would not amount to so much as to render us unable to compete fairly with English and other manufacturers.—*Sydney, Dec.* 2. K. C. B.

THE DENABY STRIKE.

SIR,—The perusal of the Sheffield, Maxborough, &c., newspapers have placed me in possession of the true bearing of the case. The commercial manager of the colliery gives a most appalling statement, and the question is—On whom does the blame rest of sending bad coal away? The pitmen sent the coal to bank, which Mr. Nicholas states was mixed with soft small coal, the cause of the rejection by the Russian and our Government. Whose duty is it to see that such a state of things ought not to exist? I say decidedly the commercial managers. Let it not be said that such a practice exists in Yorkshire. Let Mr. Buckingham Pope exercise his reasoning powers, and he will agree with me that the entire blame rests with the commercial manager for allowing such coal to be loaded at pit-mouth into the wagons. The entire Yorkshire coal trade are deeply interested in this matter, which affects the district at large.

Little Tower-street, Jan. 1. —— W. J. THOMPSON.

CHONTALES MINING COMPANY, AND ITS MANAGEMENT.

SIR,—In the report of the fifth ordinary general meeting, which appeared in last week's *Mining Journal*, the objections taken to my candidature are—"In the first place Mr. Palmer resided at Bristol, whereas it was advisable that a director should reside in or near London. In the next place, the directors did not consider that Mr. Palmer knew anything in particular about mining." As regards the first objection, I ask a question—Where does the noble Chairman reside? The answer is near Salisbury. That is not in or near London. The next objection that the directors did not consider that Mr. Palmer knew anything in particular about mining, The first question I would ask the directors is whether I knew more than they wish me to know, for let me tell them that I have on many occasions visited the Chontales office for the purpose of reading the manager's letters on the arrival of the mail, and two letters I read previous to the last half-yearly meeting astounded me. One remark I shall not easily forget. The manager states he was glad that the directors had not given orders for the sale of the stamps. There were the stamps which were necessary for the crushing of the ore taken from the rich nail. He announces in the following letter the sale of pneumatic stamps and stores. We are aware what the pneumatic stamps were sold for, and, as the officers are our servants, if we ask for the information what the stores were, and to whom sold, it is their duty to give that information. What we should like to know was there any other motive, beyond that of realising additional capital, having at the same time ample money in hand.

Not being a civil or mining engineer my practice has been for some years on obtaining information from reading of the manager's correspondence, to submit them to an authority, a gentleman of independent position, and who has had the management of gold mines in Australia, placed, as far as the operations are concerned, somewhat similar to our own. I enclose you a letter, dated May 15, 1879, from a former manager, knowing you are much interested in the affairs of the Chontales Company, and being for obvious reasons well acquainted with the property out there. I should be glad at this critical period to give any information required by yourself or friends; of course, gratuitously. Our present manager, April 28, 1878, Chontales, writes: "I notice the contents of your letter, with which I quite agree." His letter, Sept. 1, 1878, in which he states—"I am in receipt of yours of July 16, and am glad, and shall be always glad, to get a letter from you. I am also glad that you have asked nothing, as it is best to get all information from our London office." Towards the conclusion of his letter he says—"I should be glad to see you out." After receipt of this letter Mr. White was forbade corresponding with me. Another source of information I had was the cashier, who through me was induced a second time to return to the Chontales Mines. I had some scores of interviews with him before he had any idea of returning, and it was not without making myself fully acquainted with all the surroundings of the Chontales property. Now, I ask the question—what do the directors know of the practical part of the working of our property? Our noble Chairman has admitted that he knows but little of the practical part of mining operations, I challenge the other directors as to what they know, or any of the nominees of the directors. Mr. Harris was named as a director, and the very curt remark as to his being suitable for the position made by the noble earl was that he held the necessary qualification. In the absence of any further remark from the proposer, is it a knowledge of mining or simply that he holds 400 or more shares? A question I should like answered is—did the objections to my candidature arire from the directors or from the secretary? the latter is a clever accountant, and in liquidations he has had some experience.

Exchange Bristol, Jan. 7. —— WILLIAM BALL PALMER.

THE CHONTALES COMPANY, AND ITS MANAGEMENT.

SIR,—The directors have abstained from noticing the various letters from Mr. W. B. Palmer, which from time to time have appeared in the *Mining Journal*, reflecting on the home management, as well as on that of Mr. White, as superintendent at the mines. While thus declining, however, to be drawn into a newspaper controversy, Mr. Palmer's statements, persistently repeated, have received a full and emphatic refutation from the chair at several general meetings of the company, to the entire satisfaction, as it was believed, of the great majority of the shareholders present on those occasions. The recent defeat of Mr. Palmer's candidature for a seat at the board has led him to indulge not only in a renewal of his former statements, but in addition to misrepresent the action of the board, through Mr. Truran, the secretary, in connection with Dr. Bradley's withdrawal of his proxy, given in the first instance, and under a mistaken impression, to Mr. Palmer, whose letter bearing on the subject appeared in the *Mining Journal* of Jan. 3.

As longer silence might, by a section of the shareholders not present at the general meeting on Dec. 29, be construed as a quasi-admission of the truth of Mr. Palmer's representation of this latter incident, the directors feel themselves under the disagreeable necessity of disabusing the minds of shareholders in reference to the facts of the case. It would be useless endeavouring to follow Mr. Palmer through all the accusations contained in his letter of Dec. 31, but the question he has raised of the directors' interference with his proxies calls for a distinct reply. The facts are as follows: Mr. Palmer put out a circular soliciting proxies before the issue of the directors' report and circular. The secretary, not having the proxies of two of the largest shareholders in favour of the board, as on previous occasions, wrote them on Dec. 23, and asked for their proxies in favour of the Chairman, unless they intended to be present at the then forthcoming meeting. To this Dr. Bradley replied under date Dec. 25 that he had already given his proxy to Mr. Palmer, "believing he would work in harmony with the present board, and offer no fractious opposition to them, otherwise he would not on any account have given him his support." As the whole course of Mr. Palmer's proceedings was in open and avowed hostility to the directors, the secretary, on receipt of Dr. Bradley's letter, on Dec. 27, telegraphed and wrote to him in reply, that he must have been misled if he thought Mr. Palmer intended to work harmoniously with the present board, and Dr. Bradley thereupon withdrew his proxy. It will, therefore, be seen that the communication with Dr. Bradley was sent in reply to his letter to the company, and not in consequence of Mr Palmer's having sent his proxies to the office on the Dec. 27, as asserted by him. The action of the secretary was perfectly straightforward, and fully justified by the circumstances of the case.

Had Mr. Palmer been elected the members of the board could not have acted with him. In their opinion he is unsuitable as a director, and they fail to see in what way the shareholders could have been benefited by his services. The directors would fearlessly appeal to all the shareholders who attend the meetings. . . .

London, Jan. 8. J. JAMESON TRURAN, Secretary.

DEPRESSION OF THE TIN TRADE—RED RIVER.

SIR,—If the remarks of Mr. E. Davies in last week's *Mining Journal* be true, and the waste of ore so great as he mentions, it is surely time that shareholders in the mines should at once interfere in the matter, and not allow the antiquated notions of mining captains to prevail to such an amount of loss to themselves as your correspodent mentions. That more economical machinery may be used cannot be doubted, not only as regards waste, but labour also.

Plans and specifications of a machine recently patented, for which the inventors claim the following advantages, should be seen by all interested in mining.—1. Space required for dressing-floors reduced. —2. Quantity of water required lessened.—3. Slimes discharged with comparatively no waste, and at once allowing no full pits to be flushed. 4. Sand or roughs separated without hand labour to the extent of one-half of the dressing cost by present appliances. It is believed that the apparatus referred to will save one-half the present cost of dressing, and will be an equal or greater saving in waste.

Stoke Newington-road, Jan. 7. OBSERVER.

SMELTING IRON WITHOUT LIMESTONE.

SIR,—Knowing the interest taken by the *Mining Journal* in all things connected with metallurgy and progress, I drop a few lines for advice on this subject, which please kindly insert in your notices. I have made an attempt to smelt iron from the rich ores of this province, but with only modified success. I have tried twice, and want to know where the weakness is.

The ore is good iron ore (magnetic), and over 60 per cent. in value. The fuel is charcoal. The furnace is a cupola, about 20 ft. high, of stone, lined with soapstone, and about 2 ft. and 3 ft. in diameter inside in biggest part. Men employed are the people of this district. Blast by means of a "trompe," a quantity of air, but of no great force. There is no limestone in the neighbourhood; I tried quartz for fluxing. The results were plenty of slag; this after exposure has rusted, showing that iron was partly smelted. Now, I want to know whether the weakness was on account of want of limestone, or insufficiency of blast; that is, want of pressure, as quantity was not wanting. The soapstone lining stood well, and I am satisfied that ordinary pig-iron would have melted in the reduction heat of the furnace. I do not mind expenditure of charcoal, and think failure was due to want of pressure of blast. Now, a cheap means of getting this is the point in a district where no iron is in the workable state.—*Serro, Minas Geraes, Brazil, Nov.* 27. GERAES.

CANADIAN MINING, RAILWAY, AND GENERAL INTELLIGENCE.

SIR,—Situated on Thunder Bay, on Lake Superior, in the western part of Ontario, Port Arthur, or as it used to be called Prince Arthur's Landing, is attracting much attention, and seems destined to be a very large city. Its situation is similar to that of Toronto, on Lake Ontario, only it stands on the shore of a greater lake—Lake Superior. Rising from the water's edge the town is built on the side of the hill facing the east. Towards the west are higher hills, while towards the south the coast of Thunder Bay trends onward till the Kanamistiquia river is reached. The opening of the Canadian Pacific Railway between Winnipeg and Port Arthur has increased the traffic wonderfully. The building of the main line east of Port Arthur has had a tendency also to increase the traffic, as most of the supplies were brought from Port Arthur, and much of the money in payment of wages found its way back to the town.

It is now 205 years since De La Hut, the French Canadian pioneer, built the first cabin on the shores of Thunder Bay, and to-day we have a town about 10 years old, which seems destined to be another Chicago, or another Milwaukee. During the present fiscal year the shipping visiting the harbour exceeded 400,000 tons, and the Customs' dues fell little short of $200,000.

Grain Trade.—The transport of grain from the West, *via* Port Arthur to Montreal, is likely to become great, as the statistics show, and the all water route seems to be preferable. Cost of the different routes would be—From Port Arthur to Montreal, 1·36 miles per ton per mile, or $1·70 for distance, plus lake insurance 70 cwts. =$2. From Port Arthur to Owen Sound at 1·36=71 cwts., lake insurance 15 cwts. Elevating and transferring at Owen Sound 17 cwts., Owen Sound to Montreal, 455 miles, at 6 miles per ton, mile $2·73, or total $3·76. Port Arthur to Montreal, all rail route, 1000 miles, at 5 miles per ton, per mile equal $5. Or $1·76 in favour of all water route as compared with Owen Sound route, and $3 in favour of all water route as compared with all rail.

Port Arthur as a Mining Centre.—This place seems destined also to be a mining centre. Not far from here in Thunder Bay is the famous "Silver Islet," while within the last two months enormously rich silver mines have been discovered about 27 or 30 miles west. This land is east of White Fish Lake; perhaps it may be 54 miles from Port Arthur. The vein itself is a beautiful sight. It is a large one, from 2 to 10 ft. wide, boldly splitting a bluff, or mountain, 200 or 300 ft. high. The Silver Mountain vein has been traced upwards of 5 miles, showing it to be a strong one. There are also caves in it, as it were, "walled in with silver"—that is, it is inside the lead, and on both sides the beautiful fretwork of silver appears as it did in 1860, when the "Ophir" was first opened in Virginia City, Nevada, on the Comstock Lead.

Assays of the ore have been made which ran from 550 ozs. to 24,000 ozs. a ton.

I saw a specimen in Toronto which must have been of the 24,000 ozs. assay, for it seemed to me to be almost pure silver.

The want of a railroad is much felt. We cannot expect the Canadian Pacific to do everything and go to everybody's farm; but if there were a construction company, who would take the risk and build short lines of rail to the Canada Pacific, it would be like the streams that make up our big lakes, and the stock of the Canadian Pacific Railroad would go up booming.

Port Arthur as a Railway Centre.—The railway centres of this country have always grown from a point. If we look at the history of Chicago, if we look at the history of St. Louis; all have grown from little villages to be large cities on account of a point. On account of the point that has been chosen has been found eligible. Add the Canadian Pacific Railway, add the mining excitement, again we have a new railway which is going to be built from Port Arthur to connect with Duluth. It is about 50 or 60 miles from Port Arthur to the American Territory, and the railway to it is called the Thunder Bay Colonisation Railway. The first sod on the route over which the Thunder Bay Colonisation Railway will pass was turned on Saturday, Nov. 22, in Port Arthur. The road is intended to be a southern outlet into American territory, giving Port Arthur direct communication with St. Paul, Minneapolis, and the wheat fields of Minnesota. It runs through the Arrow Lake timber district, and close by the Rabbit and Silver Mountain Mines, and touches the famous iron deposits on the American side of Pigeon river. It also runs within a short distance of Hunter's island, which abounds with a great wealth of timber, and will probably be the route by which the timber from that island will be taken out. The distance from Port Arthur to Pigeon river is about 52 miles, and of the line between Pigeon river and Duluth two-thirds has already been built by an American company. The road is projected, however, to St. Paul, and the Americans state that they will have their end completed as soon as the Canadian part of the line is ready for traffic. The charter was obtained from the Ontario Legislature last session. Among the parties interested in the road are Gen. Wild, Thos. Marks, Robert Laird, and D. F. Birk, of Port Arthur; A. Boultbee and C. W. Bunting, of Toronto; and Theodore W. Myers, Wm. T. Colbron, and H. D. Hull, of New York. Application for a bonus is to made at the next session to the Lieutenant-Governor and Legislature of Ontario. A petition for that purpose is now being circulated for signature by the citizens of Port Arthur.

We have, therefore, in Canada a new field of wealth. It may good or it may be bad; but from all the evidence I can find it is good. One thing is certain, that the Americans are ahead of the Canadians and ahead of the English. They have got most of the good territory, and they will make companies and go to England and sell out our own soil for five hundred times what they paid for it. But it is all business, and if they are enterprising it is more shame to ourselves.

At the British Association meeting there was a demand for statistics with regard to the mineral wealth of Ontario. I was down at the Crown Land Office of Ontario to-day, and I heard that the Government of Ontario had organised a system of statistics for mining.—*Toronto, Dec.* 15. —— BOURONITE.

THE GOLD MINES OF WALES.

SIR,—In the *Mining Journal* of Nov. 22, 1884, one of your correspondents calls attention to the gold mines of Wales. And in reading his notices and questions I considered they were quite reasonable and timely. All those who are acquainted with these mines must admit that his narration in regard to their present state is generally right. They are working at Gwynfynydd. But there may be difference in the ideas and conclusions of people as to the cause of their present low and regardless state. I believe that if the questions your correspondent presents to the public at the end of his narration be fully answered without any prejudice, capitalists of enterprising spirit would receive much information for the future.

He asks, in the first place, whether the gold which drew capitalists here from 20 to 30 years ago belonged really to Wales, or was brought here from some other country. In answer to this question, I admit that a deceitful use of foreign gold may have been made, as there are some in every branch of trade who think that by deceiving they can obtain wealth and honour the easier. But, however far this deceitful mode of carrying on business was used, there is a sufficient number of facts to prove that abundance of good gold belong in reality to the mountains of Wales. And the amount that has been dug up ought to encourage rather than dishearten searchers for the precious ore. He also asks—"Were really wise men duped?" To this question I may say, that I acknowledge that this may have often been the case; but the principal causes of the failure of the gold mines here are so plain that every wise man could and should have avoided them. And my effort at present, if you will kindly allow me space in the *Mining Journal*, shall be to note some of the chief causes that brought on the failures and disappointments in regard to gold mining, which, to say the least, is, to a great extent, the cause of the present state of this business in Wales.

As I am only a common workman and not personally acquainted but in the neighbourhood of Dolgelly, I shall only notice the mines in this district, and for the present purpose I believe the field large enough, and the number of mines opened within it, and the amount of gold it yielded sufficient. As to these mines, I shall bring to notice Cwmheisian Mine first, inasmuch as at this place gold was discovered previous to any other one in the district during the period mentioned. And sufficient proofs have been had that it contained considerable abundance of gold, although only very little, if any, of it was brought to the public market. Large and costly engines were put up, but owing to the carelessness or unskilfulness of those who worked them, hardly any success was obtained. And I was told by a respectable gentleman connected with the work that ½ ton of quicksilver was let into the river, which is a proof either of carelessness or unskilfulness, or maybe of both. Gold can be obtained on the river sides from this place downwards to the distance of 4 or 5 miles by washing the soil in a pan. But I have not heard of any discovery made in this manner higher up. About ½ mile to the west from Cwmheisian is Gwynfynydd Gold Mine. This place has proved itself noted for its richness, if we bear in mind how little work was made underground. Two miners have dug up 7 lbs. there in one day. And the testimony of the most experienced workmen that have been working there, is that it yielded much more gold than was spent in a sensible and proper manner.

From 3 to 4 miles to the south-west of Gwynfynydd is Cefn Coch Gold Mine. I am not aware what was the whole amount produced by this ore, but I know that about 5 lbs., if not more, of gold was found in this place within a short time, which proves that the precious ore is here also. About 1½ mile to the south-west of Gwynfynydd is Dolfrwynog Mine, which has produced much gold. And there are excellent examples to be seen at present at the Geological Museum in London. A small river passes this mine, which has about 2 miles distant to run before emptying itself into the Mawddach, and gold can be had on its sides this distance by washing the soil in a pan. To the north-east of Dolfrwynog, and about 7 or 8 miles distant from it, is Castell Carn Dochan Gold Mine. Little in comparison has been worked underground at this place. But although this is the case the handsome amount of 1639 ozs. of gold were obtained out of it, and for which over 6000*l.* were received. And several experienced workmen consider that from 1500*l.* to 2000*l.* of this sum ought to have gone into the pockets of the shareholders.

The next mine which shall be noticed is the Clogau—the chief gold mine of the Principality. Work has been carried on here a long time in search for copper previous to gold having been found there. And in the copper rubbish mounds it was first discovered here, and that more abundantly than in any other place in Wales. The year in which discovered was 1854, and from this date to the end of the year 1864, 10,778 ozs. were dug up at this place. Large sums have been dug up at different times after, the amount of which I am not in possession of exact account. These facts prove beyond doubt that there is good abundance of gold in the neighbourhoods of Dolgelly. If these notices be acceptable I shall endeavour in a short time to note some of the chief causes of the failure that followed trials in gold mining in this district, and also to explain the present state of the gold mines and their future prospects.

Gaullwyd, Jan. 6. —— MWNWR.

UNITED WELSH SLATE COMPANY.

SIR,—Can you or any of your numerous readers give me any information respecting this company, in which I am interested? It was, I think, in 1883, built upon the ruins of St. Bride's Welsh Slate and Slab Company, in which I held some shares. Of this company a Mr. Davies was a director, and in August, 1883, he wrote, asking me to take some shares in the new company, of which, as the prospectus stated, he was to be made a director. In his letter he stated that —"Several shareholders in the old company had applied for a greater number of shares in the new company than they held in the old. And no wonder, if he told them, as he told me in this same letter, to "read carefully over the new prospectus; I can assure you, extraordinary as it may read, it is all greatly understated. We shall soon pay 20 per cent., and ultimately 30 per cent." On Aug. 9, 1883, the same sanguine gentleman wrote:—"You may depend upon it, that now there can be no better investment; you will see it pay 30 per cent.; so I hope to find from our secretary (Mr. J. A. Green) that you have taken my advice—to take 50 or 100 shares." This advice I did not take.

On Feb. 4 I wrote to the secretary asking if I need send the certificate of the shares held by me in the old company to be endorsed by the new. He replied on Feb. 18—"It is not necessary. We shall be sending out the new certificates in the course of a week or so. Hearing nothing, and receiving nothing from this gentleman, I wrote again June 16 making further enquiries. Mr. J. C. Sharpe, one of the directors, replied, "pro secretary," on June 18, saying, "The name of the company is shortly to be altered, and until then certificates have not been printed and prepared. A general meeting of shareholders will be held for this purpose, after which certificates will be issued." No notice of this meeting having been given me, and no certificates having been sent me, I again wrote on Dec. 3, in reply to a call notice, saying that I did not feel inclined to pay any more calls until matters in connection with the company were more satisfactory to me. Mr. J. Clarkson, another "pro secretary," replied, saying—"Your letter will be replied to early next week, when

will have had an opportunity of taking the instructions of the directors." No reply has been received up to this date—Jan. 6. No certificate has been sent. Under circumstances so unsatisfactory and suspicious I have not paid the last call, for if what I have already paid has been thrown away, it surely would not be wise to increase the loss. If any of your readers are shareholders in this "United Welsh Slate Company," I shall be glad to hear their opinion of it and its directorate.—*Ormskirk, Jan.* 6. P. B. P.

SHROPSHIRE LEAD MINES.

SIR,—We were all in great hopes when the Tankerville Great Consols Company was formed, and the three rich old mines amalgamated, but who amongst us ever dreamt of the price of lead falling for years like it has? If the price had kept up to (say) 10*l.* per ton for lead ore, with present price for blende, these mines would have been prosperous, and plenty of work for the miners of the district, and the loss to shareholders and the distress of the men would not have been heard of.

It seems surprising that the liquidators do not draw the tributers' lead ore for the last month's working to surface, make it marketable, sell it, and pay the men for raising it, before the water rises up the mine and covers it. At the Bog Mines more especially we learn there are several good piles of rich stuff thus lying in the mine, and that when the liquidators paid 7s. 6d. in 1*l.* they paid the tributers nothing on account of the lead ore and blende they leave thus lying n the levels and pitches. MINER.

CORNISH MINING FOR 1885.

SIR,—Just now there seems a desire for enquiry into the real state of mines, as regards their present productiveness and probabilities of early dividends, recent discoveries, coupled with the favourable character of metal statistics for last month, opening with the new year under such excellent conditions, are strong symptoms in favour of some well-directed mines known to the writer soon being in that position, thus ensuring a market price commensurate with their inherent value, in proof of which it need only be mentioned within the last two months three mines, in anticipation of early dividends, have enhanced in market price 100, 50, and 25 per cent. respectively, and judging from analogous precedents there are some few mines just now selling at prices not even approaching the value of their machinery, which I venture to predict will within the ensuing three months have a corresponding rise, the great bulk of mineral being discovered ensuring for them a celebrity not second to the leading mines of the county.—*St. Day, Jan.* 6. CHARLES BAWDEN.

MINERAL WEALTH OF AUSTRALIA—VICTORIAN MINING STATISTICS.

According to estimates of the mining registrars the total yield of gold for the quarter ended Sept. 30 was 206,598 ozs. 10 dwts. This is an increase of 16,380 ozs. 7 dwts. on the yield for the previous quarter, and an increase of 13,572 ozs, 9 dwts. 9 grs. on the yield for the corresponding quarter of 1883. The principal increases over last quarter were from the North Sandhurst, Creswick, Stringer's Creek, Clunes, and Taradale divisions, and from the Central division of the Ballarat mining district. The increase in the yield from quartz was 10,510 ozs. 9 dwts. 16 grs., while from alluvial the increase was only 5869 ozs. 17 dwts. 8 grs. The last-named branch of mining was seriously affected by the marked deficiency in the rainfall during the quarter. In every mining division quoted the rainfall was considerably less than for the corresponding quarter of the previous year, while in some cases it was less than half the quantity. The total value of gold raised in Victoria during the last quarter, at 4*l.* per ounce, is 826,394*l.*, as compared with 760,872*l.* 15s. for the previous quarter. Particulars of the yields from each mining division and subdivision of the colony are given in the statement No. 1, while statement No. 2 shows the total yield for the corresponding quarter of each year during the last decade. The area of auriferous ground actually worked upon during the quarter under review is given as 319¼ square miles, which is considerably less than the estimated area for the previous quarter. The large decrease is accounted for by the circumstance that the mining registrars were instructed to exclude from their estimates all land which had been worked out or temporarily abandoned, and only to give the areas held under leases or as claims, and upon which work was actually done during the quarter.

The number of miners on the gold fields during the quarter just passed is estimated at 28,749, as compared with 30,474 during the previous quarter. The decrease is owing to the fact that many who during one portion of the year adopt mining as an occupation, abandon it for agriculture during the spring quarter. Moreover, as has been already stated, the past three months have been very unfavourable for alluvial mining, owing to an insufficient water supply. Of the 28,749 miners located on the gold fields during the quarter, 23,257 were Europeans and 5492 Chinese. The decreases, as compared with the previous quarter, were—Europeans, 164; Chinese, 162. In connection with alluvial mining, there were 220 steam-engines employed during the quarter, being the same number as for the previous quarter; but there was a decrease of 16 engines in the number employed in quartz mining—the numbers for the past and previous quarters being respectively 859 and 877. Some steam-engines were sold and removed to the border towns of New South Wales, while several were diverted to saw-milling and other industries in this colony. The total value of the machinery and mining appliances is estimated at 1,847,961*l.*

The nine deepest shafts in the colony on Sept. 30 were as follows: Madgala Company, Stawell, 2409 ft.; Lansell's No. 180 mine, Sandhurst, 2041 ft.; Victory and Pandora Company, Sandhurst, 1900 ft.; Prince Patrick Company, Stawell (abandoned), 1830 ft.; Crown Cross United Company, Stawell, 1815 ft.; Prince Alfred Company, Stawell, 1770 ft.; Oriental Company, Stawell, 1676 ft.; North Old Chum Company, Sandhurst, 1664 ft.; New Chum and Victoria Company, Sandhurst, 1625 ft. Only two of these shafts were deepened during the past quarter—the Victory and Pandora Company's by 44 ft., and the New Chum and Victoria Company's by 65 ft. The greatest depth at which auriferous quartz was obtained during the quarter was 1760 ft., in Lansell's No. 180 mine.

There were not many discoveries of importance made during the quarter. The principal one was at Myrtle Creek, 14 miles from Sandhurst, where a farmer, while ploughing, came across some surface leaders containing gold. A crushing of 20 tons yielded nearly 200 ozs. of the precious metal, which was of such pure quality that it brought 4*l.* 2s. 8d. per ounce, the highest price yet paid for gold in the Sandhurst division. Another important discovery was that made by the Long Tunnel Extended Company, at Walhalla, who struck a new reef in their 800 ft. level, showing rich gold. Several nuggets were found during the quarter. One discovered at Blackwood weighed 3 ozs. 17 dwts., one at Heathcote weighed 18 oz., and some found at Green Gully, in the Fryer's Creek division, varied from 1 oz. to 19 ozs. each. The discovery at Green Hills (near Blackwood), referred to in last report, has not so far realised the expectations that were formed of it. The first ton of quartz crushed yielded over 18 ozs., but a subsequent crushing of 21 tons gave only 6 dwts. of gold per ton, clearly showing that the reef is patchy.

To the mineowners, legal managers, mining managers, and others who have so kindly and promptly furnished the mining registrars with statistical information, the thanks of the department are tendered. The instances are very rare indeed where any difficulty has ever been experienced in obtaining all necessary particulars respecting their mines from these gentlemen, and it is hoped that they will continue to give the valuable assistance they have hitherto so freely rendered. Any suggestions for the further improvement of these quarterly reports will be thankfully received by the department.

MINING PROFESSORSHIP IN CALIFORNIA.—At a recent meeting of the Board of Regents of the University of California, President Reid moved to create a new professorship of mining and drawing. The matter was referred to a committee consisting of Regents Winans, Swift, and Maryc.

SCIENTIFIC RECREATIONS FOR PRACTICAL MINERS.

SHORT, POPULAR, INSTRUCTIVE PAPERS FOR WORKING MINERS.*

BY EDW. DAVID HEARN, M.A., D.C.L., ETC.

CHEMISTRY—No. II.

It has already been mentioned that the elements combine with each other in weights corresponding to those stated as the combining equivalents, but it must be understood that it is only when those elements are brought into contact under particular conditions that any chemical union takes place at all. The power by which chemical compounds are produced is called affinity; if two bodies combine very readily with each other they are said to possess great affinity, whilst if there be great difficulty in effecting the combination they are said to possess but little affinity for each other. The effect of chemical affinity is now pretty well known to chemists, but with regard to its cause they know comparatively little. As the chemical elements were divided into two great classes, according as they were metals or non-metallic substances, so chemical compounds admit of classification, the most usual general classification being into acids, bases, and salts. Oxygen unites with all other known elements, and the result is an oxide of the element with which it combines; practically, however, the name oxide is seldom used unless the compound produced be one that is not acid. When oxygen combines with a metalloid—that is, a non-metallic element—the compound is an *acid*. When oxygen combines with a metal the compound is usually a *base*, which is a compound possessing the power of combining with and neutralising acids. The combination of an acid with a base forms a *salt*—the combination of an acid with a metal also produces a salt. With regard to compounds it should be quite understood, before proceeding further, that although it has been stated as a fundamental law that the same compound has always the same composition, it must *not* be concluded therefrom that the same composition always produces the same substance. Thus, it is found that sugar, starch, and gum are each composed of the same elements in the same proportions—each contains in the aggregate 6 combining equivalents of carbon, 10 of hydrogen, and 5 of oxygen. This property of combining in similar proportions is called *isomerism*, and it must be understood that compounds which are isomeric have very often totally different characters. Gum and sugar are isomeric, yet gum is not necessarily sweet, and does not crystallise and ferment, two characters possessed by sugar. Again, gum and starch are isomeric, yet gum differs from starch, amongst other things, in not being coloured by iodine. From this we learn that to produce a certain substance it is not sufficient to put together materials which in the aggregate would contain a similar proportion of the several elements. Thus 2 equivalents of olefiant gas (C_2H_4), 2 equivalents of carbonic acid (CO_2), and 1 equivalent of water (H_2O) would give in the aggregate $C_6H_{10}O_5$, which is the same as we had above, yet it is scarcely probable that we should obtain as a result either sugar, starch, or gum. This is simply mentioned to prevent the student from attempting to apply his knowledge in the wrong direction.

Returning to the consideration of the combinations of oxygen with metals, we have learned that many of them are basic, but they are not all so. The smallest proportion of oxygen that will combine with the metal usually produces a base, whilst an additional equivalent of oxygen will make the compound neutral, and still more oxygen may turn it into an acid. When an oxide unites with a definite proportion of water the result is said to be a *hydrate*. Most of the metallic oxides may be reduced or brought to the metallic state by heating them with fuel, and it is for this reason that in almost every process used in the industrial arts the object sought is to convert the ore into an oxide, and then reduce it with coal, coke, or charcoal. Chlorine likewise unites very freely with other elements—all the metals can be made to combine with it, and some of them possess greater affinity for it than for even oxygen. The union of chlorine with hydrogen produces hydrochloric acid, when the proportions are (see the table of elements) 35·5 grammes of chlorine to 1 gramme of hydrogen; and hydrochloric acid is the most important of all the acids of the radicle salts. The compounds produced by the union of iodine or bromine are of very little practical importance, except in a very few cases. The iodides and bromides resemble the chlorides. Sulphur unites very freely with other elements; its compounds with the non-metallic elements, and especially with oxygen, are most extensively employed in connection with industrial processes, many of which, indeed, would be impossible but for the abundance and cheapness of the acids produced by the union of sulphur and oxygen. Sulphur will enter into combination with all the metals, and it is in this condition—that is, as sulphides—that many of the most important ores are found. Most of the sulphides are insoluble, some of them have a metallic lustre, and many are of a black colour, but several (cadmium, arsenic, and one of the sulphides of tin) are yellow, one (antimony) is orange; one (manganese) flesh-coloured: and one (uranium) brown. The selenides resemble the sulphides. With the exception of carbide of iron (?), which is the condition in which iron is usually met with in commerce, the carbides are of little practical importance. The other combinations of one non-metallic element with one metal need not at present be referred to. The tendency of the metals to form compounds by uniting with each other is very small. They can usually be melted and mixed together, and many of the resulting alloys are of great commercial importance, but very few of them are definite chemical compounds.

The digression which we have made to examine the metallic bases and salts above alluded to can only be justified by the consideration that they are compounds which are familiar to a large number of practical men, and, therefore, form a better basis for the commencement of their studies than the gases with regard to which they often entertain erroneous notions, although they be notions which they are most disinclined to part with. As to oxygen and chlorine, perhaps, enough is already known to go on with, but the behaviour and peculiarities of hydrogen are perhaps more remarkable than either. But for hydrogen our very existence would be impossible, for it is hydrogen that furnishes a certain amount of moisture to the atmosphere without, which it would probably be irrespirable. The characters of the compounds produced by the union of hydrogen with another element are very variable. Combined with oxygen it gives us pure water, which is harmless, and in daily requisition even amongst the least chemical of us; combined with chlorine it becomes hydrochloric acid, the importance of which has been already mentioned; combined with nitrogen it forms the pungent alkali, ammonia; and combined with carbon it gives us the deadly fire-damp of our collieries. With regard to the compounds of nitrogen with another element its union with oxygen and with hydrogen need alone be referred to. These are of the utmost importance. The compounds of nitrogen and oxygen are known as the nitroxygen compounds. These form a very interesting series, but before we can learn anything about them we must briefly refer to the characteristics of the several gases separately, which we seem to have forgotten. Oxygen is a colourless gas, slightly heavier than air, and without taste or smell; it is the great supporter of combustion, substances burning in it much more brilliantly than in common air—indeed, it may be said that the brilliancy of a flame from a given substance is always in proportion to the quantity of oxygen in the atmosphere in which it is burning.

Chlorine is a yellow green gas, two and a half times as heavy as air, and with a very pungent suffocating odour; it only just supports combustion, a candle burning with a small red and very smoky flame (the reason of this being that the chlorine, although it will permit the hydrogen to burn—the light of a candle is due to the combustion of hydrogen and carbon—is not a sufficiently good supporter of combustion to cause the carbon to burn) and produces a very violent cough, if we breathe it; whilst its powerful bleaching properties are turned to enormous advantage in connection with the industrial arts. When quite pure, hydrogen has neither colour, taste, nor smell; it is but 1-16th as heavy as air, is very combustible—burning with little light and intense heat—and instantly kills small animals, although larger ones may breathe it for a short time and still recover

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Nitrogen, when pure, has neither colour, taste, nor smell; it does not support combustion, nor is it combustible, and when alone, is quickly destructive of life.

Returning to the combinations of nitrogen and oxygen, atmospheric air is entitled to the first consideration. It is fashionable to consider atmospheric air a mechanical mixture of gases, and not a chemical compound, yet all the arguments used to prove that it as a mixture could be applied with equal force to prove it to be a compound, and it is not improbable that as chemical knowledge increases, and as the means for analysing air approach more nearly to perfection (for it must be acknowledged that at present the arrangements are complicated, and extremely liable to lead to inaccurate results), it will be found that atmospheric air in its normal purity is a true chemical compound, in which the gases combine without condensation. Be this, however, as it may, it is certain that judged of by the existing means of analyses, the atmosphere is exceedingly uniform in constitution (about 77 parts nitrogen with 21 parts oxygen), no essential difference having been observed in any part of the world, nor whether the air tested were that from salubrious or unhealthy districts, from the deepest valley or from the highest elevation reached by man. The oxygen and nitrogen are constantly present, and it is upon them that the positive chemical properties of air—such as its power to sustain animal and vegetable life, and to support combustion—chiefly depend; but it is probable that the many other compounds met with in the atmosphere (although their quantity is extremely minute), such as ozone, aqueous vapour, carbonic acid, ammonia, nitric acid, &c., are as essential to render the air wholesome as the two principal gases. Thus, the breathing of pure oxygen would speedily produce a high state of fever that would deprive us of life; but the nitrogen, itself possessing opposite properties, serves to dilute it, and render it more suitable to our wants; whilst the other compounds named may serve to make the mixture or compound perfect. Traces of light carburetted hydrogen, or fire-damp, likewise exist in the atmosphere, and in towns sulphurous acid and sulphuretted hydrogen are also sometimes found—in fact, atmospheric air is found to be an admirable carrier of almost all the volatile compounds which emanate from the earth's surface.

Regarding atmospheric air as a mechanical mixture only, the compounds of nitrogen with oxygen are five in number, consisting of two equivalents of nitrogen, with 1, 2, 3, 4, and 5 equivalents respectively of oxygen. These compounds differ widely from each other in their characters, but with the exception of the last, N_2O_5, which is called anhydrous nitric acid, they are of comparatively little practical importance. Nitrous oxide, which consists of two equivalents of nitrogen with one equivalent of oxygen, can be breathed for a short time, when it produces a remarkable temporary intoxication, which upon some constitutions has a dangerous violent effect. Nitric oxide contains twice as much oxygen as the nitrous oxide; the most characteristic property of the nitric oxide is the formation of red fumes when mixed with additional oxygen, or even with atmospheric air. Hyponitrous acid and nitrous acid, the two following compounds of the series, are of little importance; at ordinary temperatures they exist as a deep orange vapour, but the colour gradually becomes paler and paler as the temperature is lowered, becoming pale yellow at the freezing point of water, and colourless at the zero of Fahrenheit.

Nitric acid is used extensively in the industrial arts; it dissolves silver, copper, and most of the metals; and mixed with hydrochloric acid forms aqua regia, which will dissolve both gold and platinum. In connection with nitric acid it is worthy of notice that the stronger acid is frequently less efficient in dissolving metals than that which is weaker. It has already been stated that the combination of nitrogen and hydrogen produces ammonia; the proportions must be three equivalents of hydrogen with one equivalent of nitrogen—this is the only compound of these two elements known. Pure ammoniacal gas is slightly combustible, and combined volume for volume with oxygen will feebly explode; but it extinguishes flame. Ammoniacal gas is readily absorbed by water, and this circumstance is taken advantage of in the industrial arts—a strong solution of ammonia in water being much more easily used than the gas itself.

Thus far we have considered only the combination of single elements to produce simple compounds; when two or more compounds are brought together the usual result is that they suffer decomposition: that is to say, the simple elements forming the respective compounds are liberated from each other and assume a state in which they are fitted to form new combinations. According as the liberated atoms appear at the positive pole or at the negative pole of the electric apparatus they are divided into two classes—the electro-negative elements are those which appear at the positive pole, and the electro-positive elements those which appear at the negative pole. Under varying circumstances the same element will be electro-positive or electro-negative, inasmuch as every element is negative towards one portion of the elements and positive towards the remainder. This circumstance permits of some notion being formed of the nature of the decomposition that will probably take place upon bringing two given compounds together. Thus, if a compound consisting of a strongly electro-negative element combined with a neutral element be brought into contact with a strongly electro-positive element the result of the decomposition will be that the electro-positive and the electro-negative will combine, to the exclusion of the neutral element. So also it is found that two nearly neutral elements can better exist (without suffering decomposition) in presence of each other than two elements, the electrical properties of which are more strongly opposed. But, of course, decomposition will only take place when the compounds brought together are in a state fitted for chemical action (as, for example, dissolved in water), and provided they contain the elements of other compounds possessing electric properties more nearly similar to each other. Thus, supposing we have two compounds consisting each of a salt in solution, precipitation will occur, upon mixing the solutions, provided the base of the one can produce with the acid of the other a compound insoluble in the water of the given solutions. In referring chemical decomposition, however, to electric action it should be remarked that although the hypothesis is capable of being very largely applied in practice, and, at all events, forms a most useful aid to the memory it should not be too implicitly relied upon—it furnishes us with a very useful general rule, but one which is by no means without exception. Heat, electricity, light, and various other agencies applied sometimes singly, sometimes in combination, are constantly being used by the chemist to effect the decomposition of the substances he has to deal with, but well as he comprehends the nature of those agencies, and the effect which they produce, the cause of decomposition and of chemical affinity have still to be discovered.

MINERAL WEALTH OF ILLINOIS.—From Vice-Consul Dunn's report of the trade and commerce of Chicago it appears that the State produced in 1883 (used almost entirely for home consumption) 10,508,791 tons of bituminous coal, the mining of which gave employment to nearly 25,000 men and boys. The average value of the coal at the mouth of the mine was $1 46c. The average rate of wages paid to miners is 90 c. per ton. The wages actually paid last year in Macoupin county, the largest coal producing county, was 63 c. per ton in summer and 75 c. in winter. Attempts have been and are now being made to produce a marketable coke from Illinois coal. Up to the present the product is too soft for manufacturing purposes, as it crushes too easily under heavy weights. This State has about 18 large rolling-mills and steelworks, with a capacity of about 870,000 tons of rails, bars, and other iron products. Three or these mills are located in this city or its immediate neighbourhood.

HOLLOWAY'S PILLS.—Any dyspeptic sufferer aware of the purifying, regulating, and gently aperient powers of these pills, should permit no one to cloud his judgment or to warp his course. With a box of Holloway's pills, and attention to its accompanying directions he may feel thoroughly satisfied that he can safely and effectually release himself from his miseries without impairing his appetite or weakening his digestion. This most excellent medicine acts as a nervine and boldly tonic by aiding nutrition, and banishes a thousand annoying forms of nervous complaints. An occasional resort to Holloway's remedy will prove highly salutary to all persons, whether well or ill, whose digestion is slow or imperfect, a condition usually evidenced by weariness, langour, listlessness, and despondency.

THE DRAWING OF TIMBER IN MINES.

In scarcely any department connected with mining operations can greater economy be effected than in the adoption of improved methods of timbering or supporting the working places and thoroughfares in mines, such as have of late been introduced in some districts. A considerable saving can also be effected in using certain descriptions of timber for different purposes, for where it has to be left in a mine the cheaper kinds are those which should be adopted, such as Scotch birch, beech, and alder, whilst where the timber can be recovered and used over and over again oak, red pine, and locust, will be found most economical. A great deal of the useful effect of timbering in mines is lost, owing to the way in which the props are set, so that a larger quantity of the material is required where such is the case than where the full amount of useful effect is obtained by a really good system. Where the props or supports in a mine are not in a line with the direction of pressure it will be evident that some of their useful effect will be wasted. It is, therefore, advisable that in working places the men should be directed to place the timber in rows after the face, and draw the back row as the face advances, so that by so doing a great deal of the ordinary waste when this is not done is avoided. At a coal mine in Lancashire a system has been carried out where little timber is required for propping. The mode of working is that known as end longwall. Packing-dirt was got by blowing up the floor in the roads, and a place about 3 ft. wide along a ribbing was made, which formed a base for holing, and as the removal of the dirt took place the men followed up by holing 6 ft. underneath the coal, setting sprags 4 ft. apart. This was continued until there was a face 300 yards in length, short drawing roads being left at intervals. No chocks were set in any of the roads, and very few bars or props. When the holing was done the sprags were removed, the coal falling as they were taken away.

The cost of the propwood did not exceed a halfpenny per ton of the coal got. Under ordinary circumstances, however, drawing of timber should be done at night when the miners are out, and additional props set so as to make the work easier as well as safer, whilst a lever and chain with a holdfast at the end could be advantageously used, and for this work skilled men should be selected. In some parts of the Continent vast quantities of wood are used, especially in connection with thick coal seams. At one of these mines the miners have to support themselves on ladders, the roof being maintained by long poles or trees of pine. Some of the stalls indeed look like small pine forests; but a good deal of the timber is saved. Some of the seams are from 25 to 30 ft. in thickness, and are divided into blocks from 60 to 100 yards long. Each stall is well maintained with 6 ft. props, and holes into the gallery in advance of which is the goaf. The miners then run back for some distance to extract a safety rib which is left in the first instance, and then bring down the coal above them by withdrawing the props which timbered the stalls. In other localities where the seams are very thick, when it is desired to bring down the top coal, men appointed for the purpose place dynamite cartridges near to the top of the trees with safety fuses attached. The men then retire, the fuses are lighted, the dynamite explodes, and coal comes down with a tremendous crash; but a good deal of the timber is little the worse for the operation. In some of our own districts the timber costs from 6d. to 9d. a ton of the mineral obtained; but were better means devised there is no doubt the same advantages could be obtained for half the expenditure; so much depends upon the system that is pursued. The subject, however, is one that should now receive marked attention on the part of those who have the management of mines, and who, of course, desire to work them in the most economical manner.

NEW SYSTEM OF TRANSPORTATION.

The question of cheaper railway charges, which from time to time has been noticed in the *Mining Journal*, continues to occupy attention. As a result of the keen competition of American and Continental firms, and the consequent low prices to be obtained for produce, our manufacturers and mineowners in order to pay expenses, if not actually to make profits, are obliged to use the most rigid economy, and the heavy rates charged by the railway companies are claiming their most serious attention. Anything, therefore, tending to lessen this item in the cost of production will be welcomed by those interested. Mr. J. S. BALDWIN, of Newark, N.J., has published a pamphlet, in which he gives a description of the means by which freight of certain kinds and sufficient quantity may be carried overland for 60 cents per ton per 1000 miles. He proposes to carry in bulk all grains, coal, and all minerals, in pieces as large as a man can easily handle; in bales, hay, straw, cotton, and all similar substances; in cases, all merchandise from pianos downwards; and with suitable stowage costing not more than 30 to 50 per cent. extra, any object not more than 3 ft. wide, 5 ft. high, or 30 ft. long, and not weighing more than 8 to 12 tons. Very long timber, very large masses of building materials, large pieces of machinery, live stock, and inflammable substances would not be carried, nor perishable articles, or such as are now sent by express. The principal features of the system are—A permanent foundation instead of ballast requiring adjustment, a permanent cover or shed over the whole line instead of a cover carried by each vehicle, instead of having the running gear attached to each vehicle there are stationary wheels which simply revolve in place; the rails are attached to the vehicle, stationary power instead of locomotive is used, and instead of a succession of short trucks there is a smaller number of very long ones narrower and lower.

It is proposed that each truck be 3000 ft. long, 50 ft. broad, and 60 in. deep. The stationary engines are placed at such distance from each other less than the length of the truck that the latter will at times overlap two stations, and shall always be under control of at least one engine. The trucks will, it is stated, be flexible enough to pass a curve of 400 ft. radius, and this is proposed to be accomplished in the following manner:—Suppose each truck to be a very long boat, built upon and sustained by a keel running upon stationary wheels, while lighter wheels, also stationary, bear upon light rails corresponding to the gunwales of a boat, and maintain the equilibrium of the truck. This keel, a compound bar of steel, 1 in. wide and 4½ in. deep, could be bent around a curve of 400 ft. radius, and still remain quite within the limits of perfect elasticity. The bottom and sides of the truck are formed of No. 12 corrugated mild steel; the corrugations being at right angles with the keel, will, in passing a curve, open and close like those of a bellows.

The bending of the trucks would not affect such loads as grain, cotton, hay, or other fibres, and boxes of ordinary sizes properly stowed would hardly be disturbed; the same is true of barrels. Minerals might be put in casks, and these laid on their sides, but a far better way would be to suspend in the truck a series of chests, from 6 to 20 ft. long, in which anything could be carried within certain limits as to weight. These chests might be kept in position by a number of short spiral springs, which would give a distributed and elastic support. The guide-wheels would bear any undue pressure that might arise through bad loading.

The rails are made so that they shall always present a good rolling surface, but their joints are not called upon to sustain any tensile strain whatever. Motion is supplied in the following way. The keel is a compound bar, the two parts of which are united by rivets, which project on each side, forming a continuous line of studs, spaced as accurately as possible; it is apparent that if the keel were for a distance of 30 ft. near each engine wholly or partially embraced by a flat endless square-linked chain, having notches or elastic prongs which should engage the studs, then motion imparted to the chain would be imparted to the keel and truck. Mr. Baldwin also gives a description of the method of loading and unloading the trucks, of terminal facilities for disposing of the goods and of the construction of the permanent way. His estimate of the capacity of his railway would be—Width of truck, 30 in.; depth, 32 in.; length, 6600 ft.; stations, 1 mile apart; interval between trucks, ¼ mile; speed, 6 miles per hour; capacity of one truck, 33,000 bushels, or 883 tons; capacity of one line per hour, 3532 tons; per 24 hours, 84,768 tons; cost of double line equipped, per mile, $75,000. We refer our readers to Mr. Baldwin's pamphlet for any additional particulars with regard to this "inverted railway," as he rightly calls it. Whether it is practicable or not we do not pretend to say; it is at any rate novel.

CHESTERFIELD AND DERBYSHIRE INSTITUTE OF MINING, CIVIL, AND MECHANICAL ENGINEERS.—At the meeting at Chesterfield this (Saturday) evening the council invite expression of opinion and discussion as to alterations that may be desirable in the rules, particularly in reference to rates of subscriptions and classes of members, for consideration preparatory to the April meeting, when definite notices must be given for settlement at the annual meeting in June. The papers open for discussion will be:—Mr. J. B. Marsaut's paper (translated), entitled "Miners' Safety Lamps." Mr. A. H. Stokes' paper, entitled "Colliery Explosions." Mr. Henry Johnson, jun.'s, paper, "On the Mining and Geological Features of a Drive through the Black Country." Mr. Arthur Sopwith's paper, "Additional Details of Haulage at Cannock Chase Collieries." Mr. Herbert Porter's paper, "The Porter-Clark Process for the Removal of Mineral, Organic, and Earthy Impurities from Water." Mr. George Addenbrooke's paper, "The Bulkley Patent Injector Condenser." The papers to be read or taken as read are:—"Counterbalancing Winding-Ropes," by C. Meinicke, of Clausthal, N. Germany. Translated by Mr. J. Clarke Jefferson, Leeds. "Colliery Winding-Ropes and their Attachments to the Cage," by Mr. P. M. Chester, Blackwell Collieries.

INNER CIRCLE RAILWAY.—Mr. A. L. FOSTER, Superintendent City Police, writes to a friend:—Referring to the conversation I had with you respecting the good conduct of the men employed on the Metropolitan and District Railway during its construction from the Mansion House Station to Aldgate, I have seen Mr. Bastibal, the superintending foreman, who cofirms the statement I made to you that upwards of 2000 men were employed, and that during the time the works were in progress no intoxicating liquors were permitted to be sold, or brought upon the works; any breach of this rule would lead to the offenders' dismissal. Upon my expressing surprise that men of this class would accede to such stringent regulations, Mr. Bastibal said he had no difficulty in enforcing the regulation. During the progress of the works there was happily no loss of life or serious accident occurred; and I am very glad to add, though this large number of men were employed within the City radius, I can not find there were more than six charges taken at our City Police Stations, and these of a trifling character. The men were allowed tea, coffee, and non-intoxicating drinks, to be brought or sold. Mr. Bastibal has been a total abstainer for several years, and I have every reason to believe much respected by the men that worked under him. I venture, as an old abstainer of 41 years, to claim the facts I have stated as a strong argument in favour of our principals; and trust the men I have referred to, and their families, are all the better for abstanence principles carried out under such conditions.

COPPER AND TIN.—Messrs. T. F. HITCHINS and Co. (Jan. 1) write:—During the past year the depression in trade has been we believe unprecedented, and the prices of produces have fallen to figures that have rarely, if ever, been known before. Whether the undertakings engaged in the production of copper find the present price sufficiently remunerative may perhaps be open to doubt, but it may fairly be assumed that anything like a continuation of the low price will offer inducements to use copper to a large extent for other purposes, and that the demand may therefore increase to such an extent as to overtake the supply, and that if the immediate prospects of copper do not tend to any material improvement it would hardly be prudent to count on any long continuation of the present depressed price. There does not appear any reason to anticipate a diminution in the demand for tin, but judging from its steady growth during the last few years rather an increase, and we must confess that we are at a loss to understand where the supply is to come from to meet this increasing demand. Under these circumstances we cannot think tin can remain much longer in its present abnormal condition, and in our opinion, therefore, consumers must expect before long to pay a much higher price.

IRON, TIN, AND COPPER.—Messrs. FRENCH and SMITH (Jan. 1) write:—The past year was marked by heavy losses, consequent on the serious shrinkage in value of all descriptions of produce. These losses were, with few exceptions, fairly met, and there were no startling revelations of rotten trade or collapse of credit which have so often before characterised similar times of depression. The history of the iron trade during the past 12 months has been gloomy in the extreme. There was a universal contraction in the demand. Reduction of make, valuable plant and machinery lying idle, and hands unemployed have been the characteristic features. Exports of both raw and finished iron show a reduction to almost every part of the globe, while the depression in the shipbuilding trade has seriously affected home consumption. During the year there has been a serious curtailment of output, and stocks are decreasing, thus placing the trade in a healthier condition, and preparing the way for good business when prosperous times return. Throughout the year rumours have been current of large shipments of tin, over production, and new discoveries; but production really has fallen off 2243 tons, consumption increased 982 tons, and visible supply reduced 2717 tons. Deliveries of copper during the past 12 months were 107,143 tons, and the supplies 106,464 tons: visible supply being 47,843 tons, against 48,527 tons in 1883, and 47,053 tons in 1882. There is nothing, therefore, in these figures to account for the heavy drop but the very rapid increase in the United States production, and the way in which it was marketed created a complete scare, which only very low prices can correct. At present prices it is doubtful if the largest and best managed mines can pay, and it is known that heavy losses are being incurred at the smaller ones. We have, therefore, probably seen the maximum of production, and the low price will certainly tend to maintain consumption.

CURE OF COUGH AND INFLAMED LUNGS BY DR. LOCOCK'S PULMONIC WAFERS.—Extract of letter from Mr. Leith, Harbour Master, Scrabster, Thurso, Dec. 8, 1884:—"The two first boxes I got gave me immediate and great relief. I have had a cough for over two years, brought on by repeated attacks of inflammation of the lungs." They instantly relieve and rapidly cure Asthma, Consumption, Bronchitis, Coughs, Colds, Shortness of Breath, Phlegm, Pains in the Chest, Rheumatism, and taste pleasantly. Sold at 1s. 1½d. and 2s. 9d. per box, of all Druggists.

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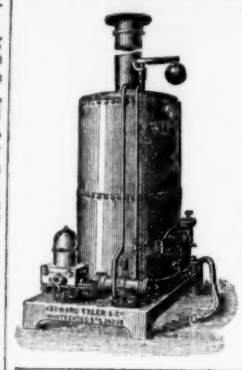

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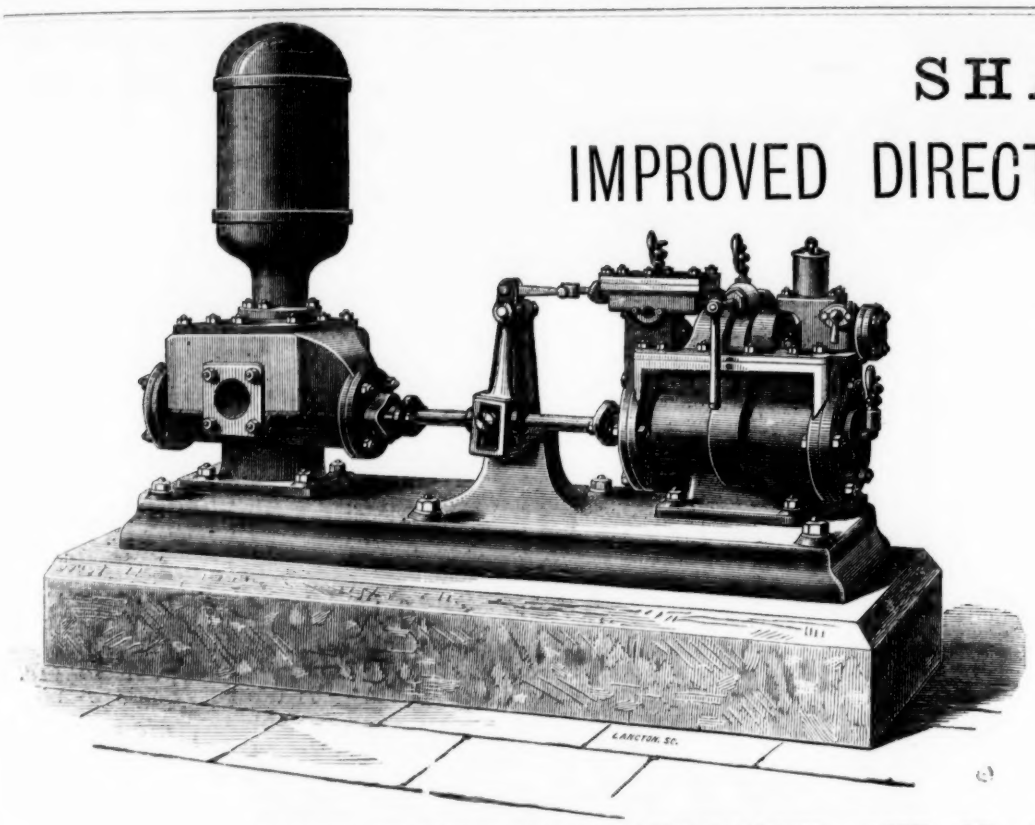

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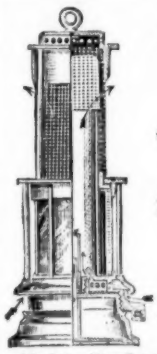

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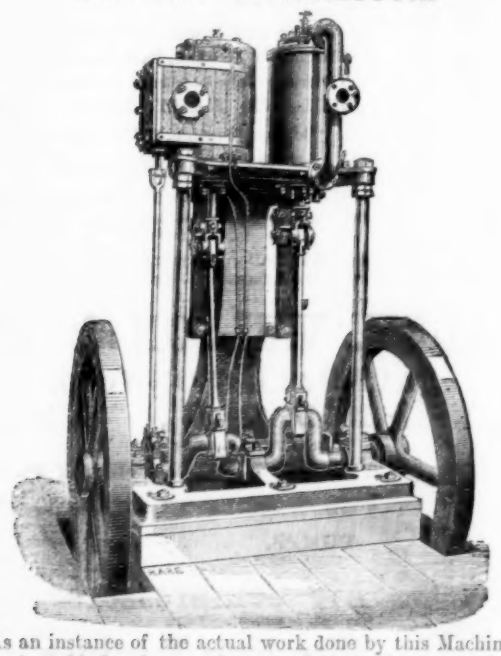

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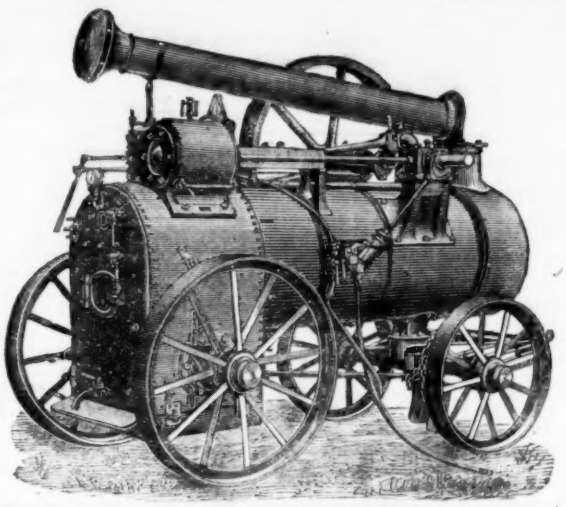

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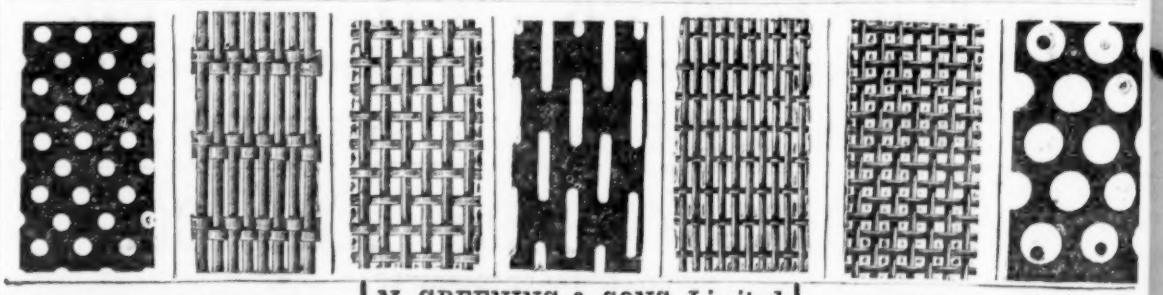

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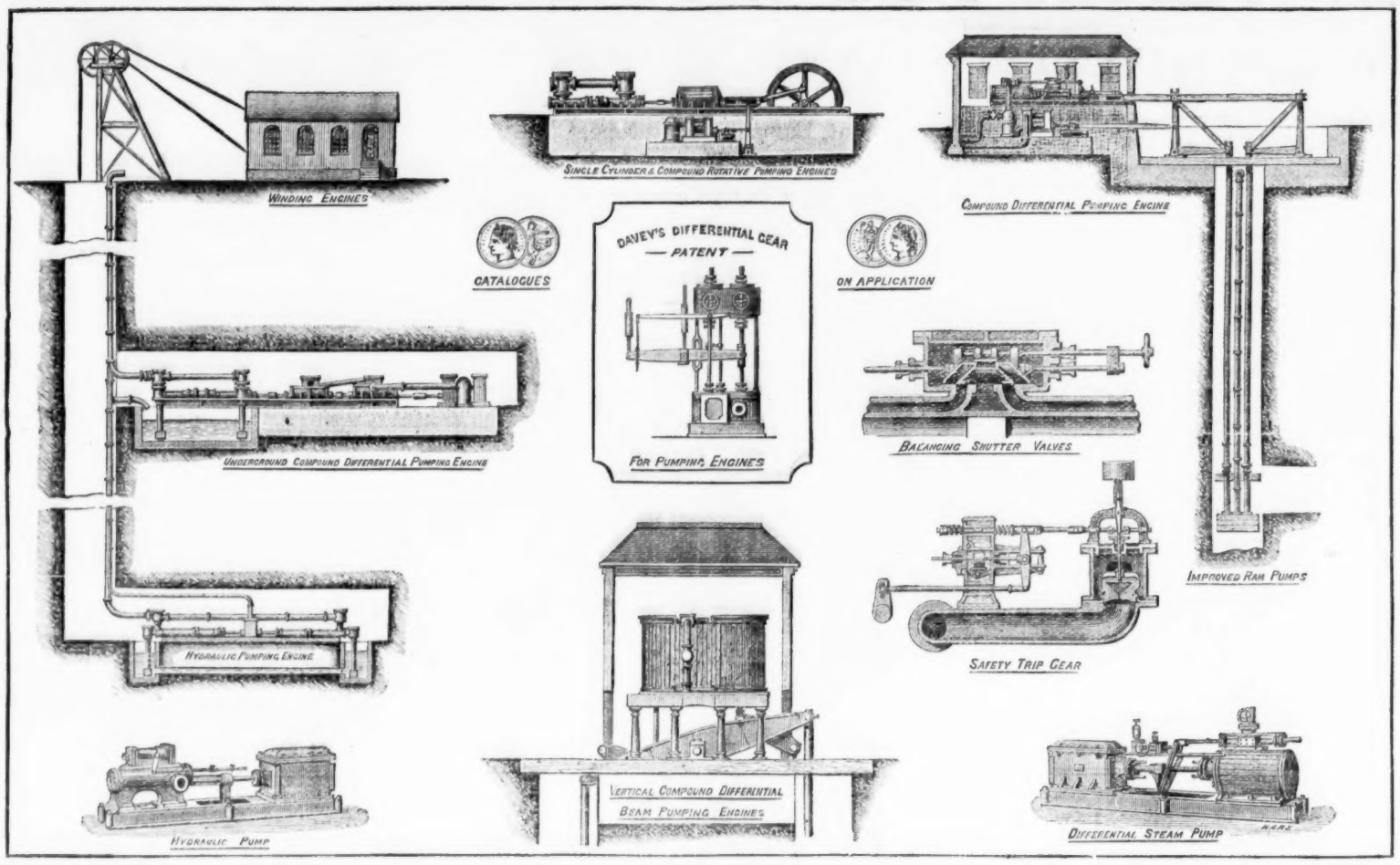

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It saves money and trouble, but like my gas purifying oxide it lasts so long that you must not expect another order from me for twelve months at least.

Yours truly,
T. F. EVANS,
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Mr. J. Bell.

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G. H. CLARKE, Sup. Engineer.

Mr. J. Bell.

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Thus the Preservative avoids the great risks which are inseparable from scaled plates, lengthens the life of a boiler, and covers its own cost a hundredfold by economy of fuel.

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I am, dear Sirs,
Yours faithfully,
THOMAS WINTER, Colliery Engineer.

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One ton of coal was saved per week, and although the fire was raked out every evening, 20 lbs. of steam were found in the boiler next morning.

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Mr. John Bell, Southwark, S.E.

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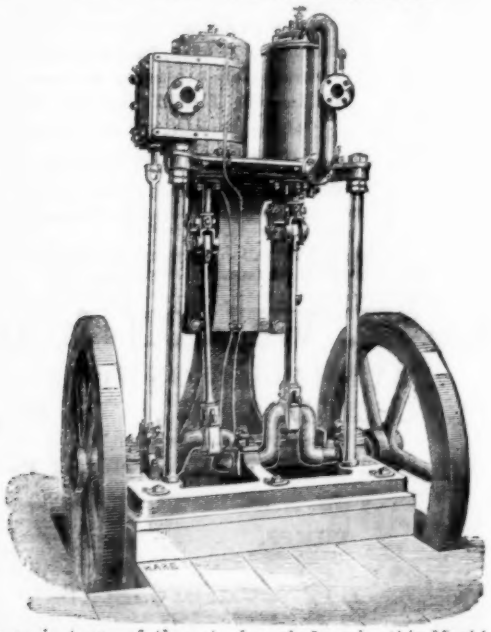

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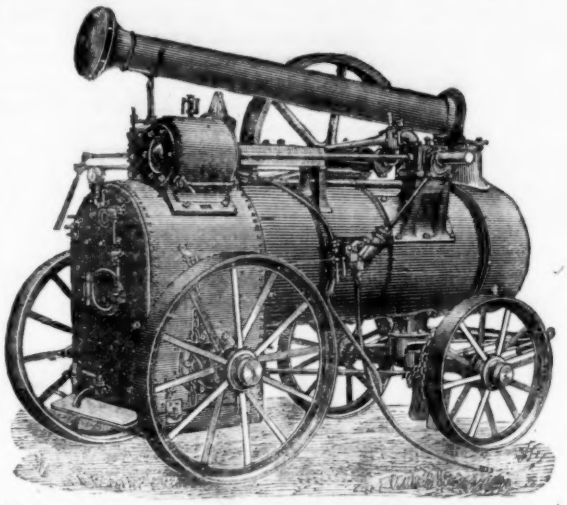

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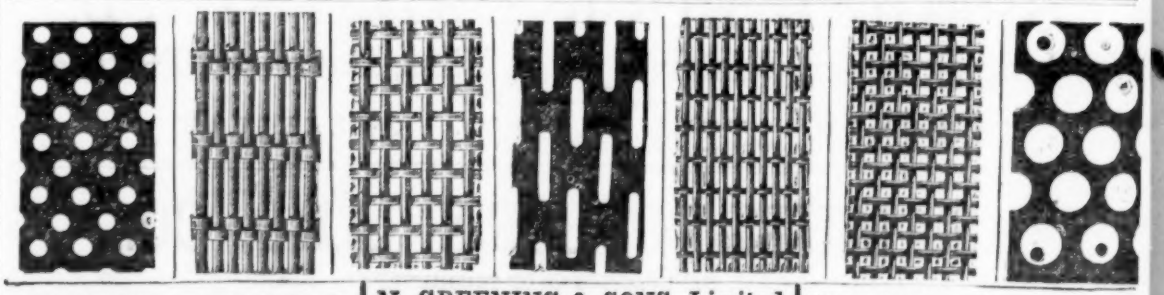

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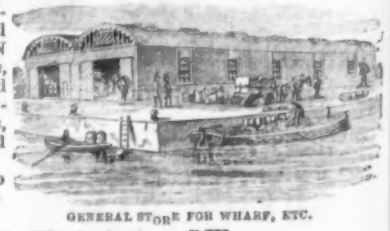

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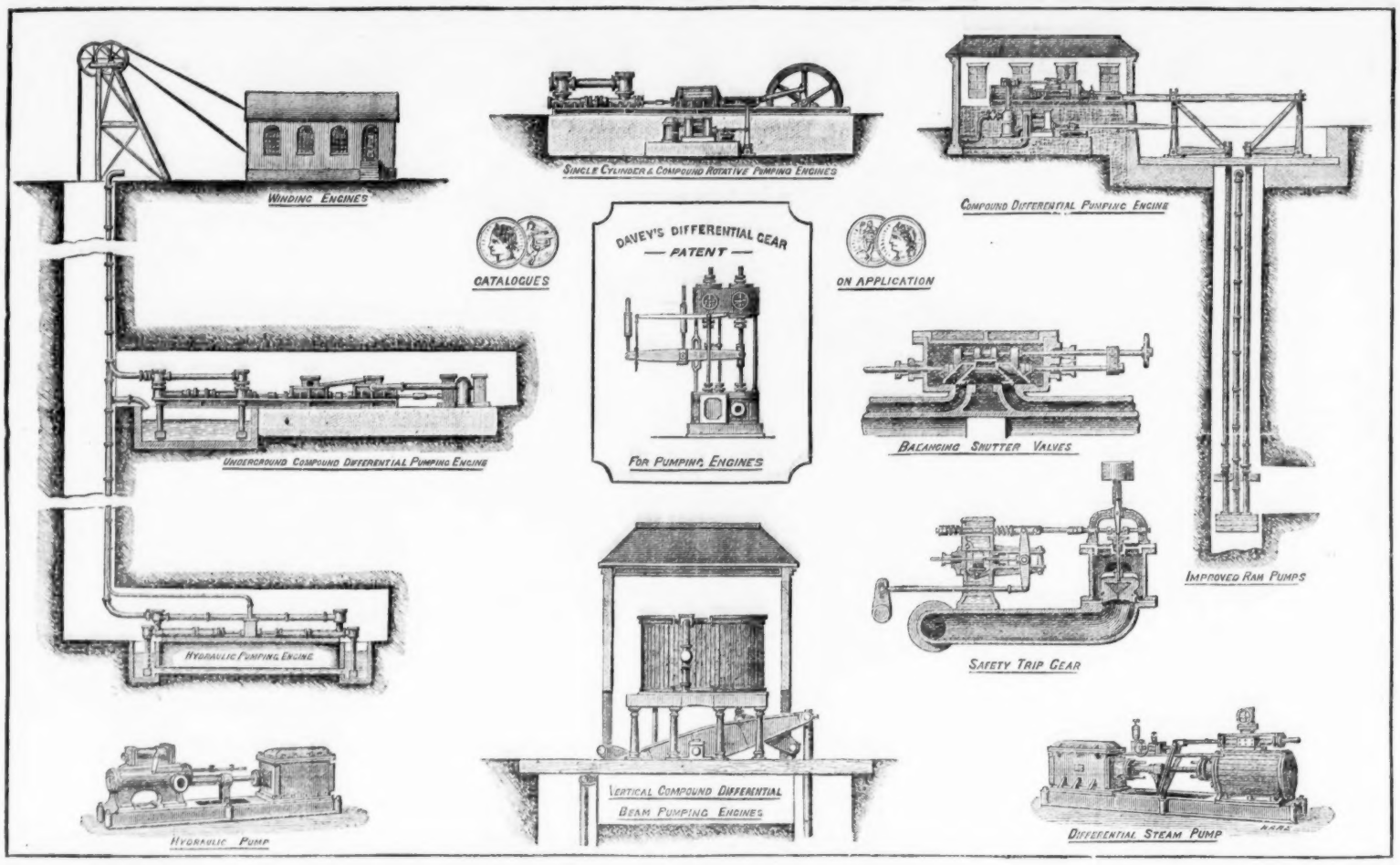

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The following testimonials refer to this Packing:—

Mona Lodge, Amlwich, Anglesey,
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DEAR SIR,—I have much pleasure in answering your note. Bad times in mining have compelled me to try all kinds of expedients in order to effect saving; some have succeeded and some have failed, but my underground manager, Capt. Hughes, has just said to me by the telephone—"The Asbestos Packing is the best thing ever brought here."

It saves money and trouble, but like my gas purifying oxide it lasts so long that you must not expect another order from me for twelve months at least.

Yours truly,
T. F. EVANS,
Late H.M. Inspector of Metalliferous Mines.

Mr. J. Bell.

Manchester, Sheffield, and Lincolnshire Railway—Steamship Department,
Grimsby, April 10th, 1884.

DEAR SIR,—I have much pleasure in stating that after a trial of over nine months, and comparing it with other packings, I can confidently recommend your Asbestos Packing. It is especially valuable when high-pressures are employed, as in cases where other packings have perished, owing to high temperatures, your packing has invariably stood well. I have also used it with complete success when a gland has heated with other packings, and also in cases of badly scored piston rods. I consider the results I have obtained by its use for our marine engines to have been in every way highly satisfactory.

Yours truly,
G. H. CLARKE, Sup. Engineer.

Mr. J. Bell.

Department of the Director of Navy Contracts,
Admiralty, Whitehall, 20th June, 1884.

SIR,—I have to inform you that your tender has been accepted for Bell's Rolled Cloth Asbestos Packing to sample submitted:—Elastic core ... ... Square.
" " ... ... Round.

To Mr. John Bell.

JOHN COLLETT, Director of Navy Contracts.

BELL'S ASBESTOS BOILER PRESERVATIVE.—This useful mixture by absorbing the free oxygen that is in the water entirely checks pitting and corrosion. It also disintegrates incrustation so immediately as to prevent its adhering to the plates. Not only is a great economy of fuel effected by keeping boilers clean, but the risk of having the plates burned is thereby obviated. It has been computed that 1/16 in. thick of incrustation causes a waste of 15 per cent. of coal; 1/8 in., 60 per cent.; 1/4 in., 150 per cent.

Thus the Preservative avoids the great risks which are inseparable from scaled plates, lengthens the life of a boiler, and covers its own cost a hundredfold by economy of fuel.

It is entirely harmless, and has no injurious action on metals. It can be put into the feed tank or boiler, as may be most convenient.

Sold in drums and casks bearing the Trade Mark, without which none is genuine.

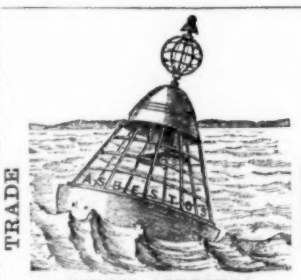
BELL'S ASBESTOS YARN and SOAPSTONE PACKING for Locomotives and all Stationary Engines running at very high speed with intense friction.

Sandwell Park Colliery, Smethwick, 1st February, 1884.

To Bell's Asbestos Works.

DEAR SIRS,—I have much pleasure in stating that I have used your Asbestos Packing for the last 13 months for our large winding engines which are running night and day, and also for the fan, pumping, and hauling engines at the above Colliery, and during that period we have not used more than one-third the Packing we had formerly; and this I attribute to your Packing on account of its great durability and general excellence of quality.

I am, dear Sirs,
Yours faithfully,
THOMAS WINTER, Colliery Engineer.



TRADE MARK.

BELL'S ASBESTOS.

The goods of this house are of the highest quality only, and no attempt is made to compete with other manufacturers by the supply of inferior materials at low prices. All "home" orders should be sent direct to the undermentioned depôts and not through Agents or Factors.

BELL'S ASBESTOS BOILER AND PIPE COVERING COMPOSITION, for coating every class of steam pipes and boilers, non-combustible and easily applied when steam is up; adheres to metals and preserves them from rust; prevents the unequal expansion and contraction of boilers exposed to weather; covers 50 per cent. more surface than any other coating, and is absolutely indestructible. It can be stripped off after many years' use, mixed up with 20 per cent. of fresh, and applied again. The composition is supplied dry, and is only to be mixed with water to the consistency required for use.

A Horizontal Boiler, 17 ft. 6 in. long, 15-H.P., gave the following results:—

Temperature on Plates - - - 186 deg.
" " Covering - - 94 deg.

One ton of coal was saved per week, and although the fire was raked out every evening, 20 lbs. of steam were found in the boiler next morning.

The following Testimonials refers to this Covering:—

Offices of the Wimbledon Local Board, Wimbledon, Nov. 28th, 1883.

DEAR SIR,—It may interest you to know that we save exactly 40 per cent. in fuel through using your covering.

Yours truly,
W. SANTO CRIMP, C.E., F.G.S.

Mr. John Bell, Southwark, S.E.

The Tamar and Kit Hill Granite Company (Limited),
Gunnislake, Tavistock, 8th April, 1884.

SIR,—I have much pleasure in stating that the Asbestos covering applied by you to the boiler of our travelling crane at Kit Hill has yielded most remarkable results. Since it has been in use we have saved fully half our coals, and have effected a great saving in the time it takes to get up steam, which is often a matter of great importance to us. I should add that the crane runs on high gantries, and is fully exposed to all weather. I have formed the highest opinion of your Asbestos as used for this purpose, and as you are aware, have had another boiler similarly covered, though it has not since been used. I can most strongly recommend the material.

I am, Sir, yours faithfully,
W. J. CHALK, Assoc. M. Inst. C.E., Engineer and Manager.

BELL'S ASBESTOS and INDIA-RUBBER WOVEN TAPE and SHEETING, for making every class of Steam and Water Joints. It can be bent by hand to the form required without puckering, and is especially useful in making joints of manhole and mudhole doors. It is kept in stock in rolls of 100 ft., from 1/2 in. to 3 in. wide, and any thickness from 1/16 in. upwards. Manhole covers can be lifted many times before the renewal of the jointing material is necessary. The same material is made up into sheets about 40 in. square, and each sheet bears the Trade Mark, without which none is genuine. It is very necessary to guard against imitations of this useful material, and to secure themselves against being supplied with these inferior articles at my price, users are recommended to see that every 10 ft. length of the Asbestos Tape purchased by them bears the Trade Mark.

BELL'S SPECIAL LONDON-MADE ASBESTOS MILLBOARD, for Dry Steam Joints, made of the best Asbestos fibre, is well-known for its toughness and purity, and is absolutely free from the injurious ingredients frequently used to attain an appearance of finish, regardless of the real utility of the material. Made in sheets measuring about 40 in. square, from 1-64th in. to 1 in., and 1/2 millimetre to 25 millimetres thick. Each sheet bears the Trade Mark.

The following copy of acceptance of tender refers to above:—

Department of the Director of Navy Contracts.
Admiralty, Whitehall, S.W., 17th May, 1884.

SIR,—I have to inform you that your tender for Asbestos Millboard has been accepted.—Mr. John Bell.

JOHN COLLETT, Director of Navy Contracts.

BELL'S ASBESTOS EXPANSION SHEETING (PATENT).—This Sheeting is another combination of Asbestos with India-rubber, giving to the steam user the special advantages of both materials. The India-rubber Washer is protected from the action of heat and grease by an outer coating of vulcanised Asbestos Cloth, thus producing an excellent joint where expansion and contraction render other materials unserviceable. This material is admirably suited to steam pipe joints and every class of valve. Valves made of this material are very durable, as they are not subject to injury by oil.

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OVER **4000** IN USE.

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PULVERIZER.

"I have great pleasure in bearing testimony to the merits and capabilities of your patent combined fine crusher and sieving apparatus. I have tried it on a variety of ores and minerals, and it pulverizes them with equal success. You can put in a small paving stone and bring it out like flour."

"In reply to your favour, I have much pleasure in informing you that the 12×3 Pulverizer we had from you is giving us every satisfaction. The material we are operating on is an exceptionally hard one. I am well satisfied with its working."

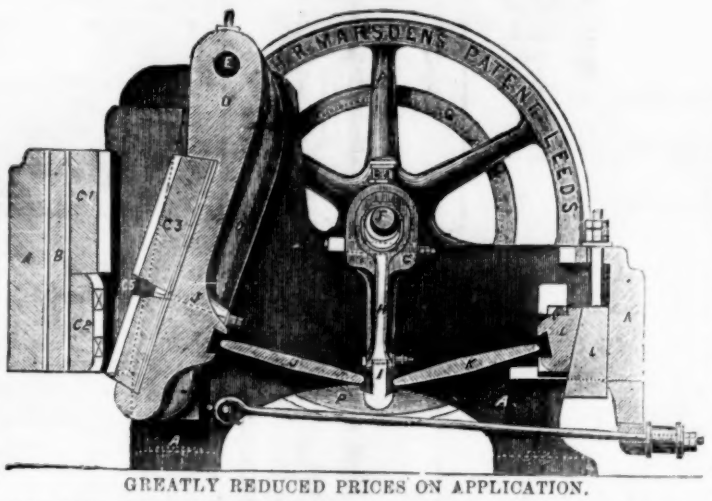
"Our experience is that the motion and mechanical arrangements of your machine are the best for pulverizing that we have ever met with."

"The reports from our mines as regards the working of your Fine Crusher (20×5) recently supplied are very favourable, although we cannot quote you exact figures. On being got into position it was tried *by hand*, with the result that it made short work of the biggest pieces of ore we put into the hopper. You might say how long you would take to deliver another of the same size."

"As I once before stated, your machine is a perfect pulverizer."

"I am sure the machine will be a success, and a great one, and there is any amount of demand for such a machine. We can work it with 20 lbs. of steam, and our engine, which is a 12-h.p., plays with the work, in fact we run the Stonebreaker and the Pulverizer both together with 35 lbs."

Also Cement, Barytes, Limestone, Chalk, Pyrites, Coprolite, &c., &c. These Machines are in successful operation in this country and abroad, and reference to users can be had on application.



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"Some of your testimonials do not give your machines half their due. I have seen men hammering away on a big rock for a quarter of a day which your machine would reduce to the required size in a quarter of a minute. I would guarantee that your largest size machine would reduce more of the Cornish tin capels (which is the hardest rock of England) n a day than 200 men, and at 1-25th the cost."

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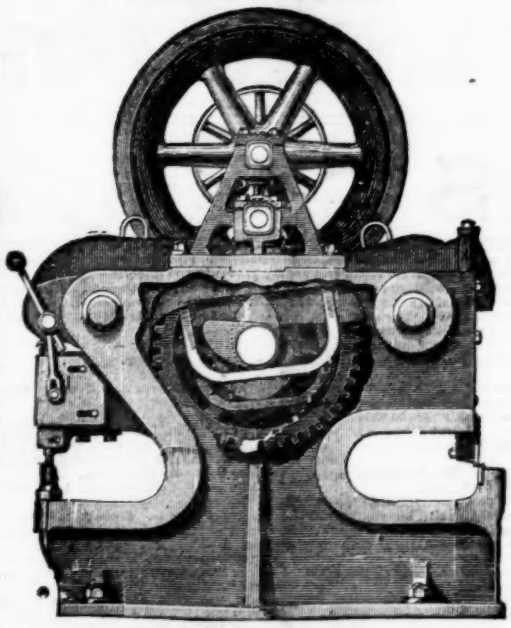

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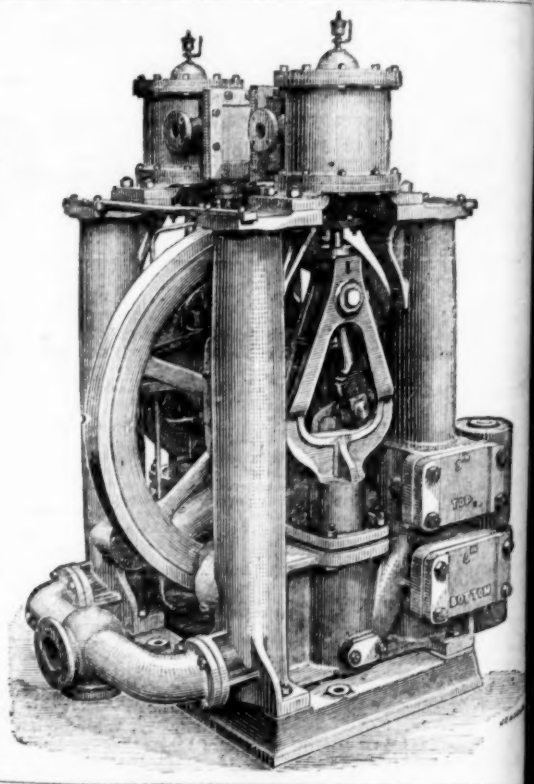

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By a special method of preparation this leather is made solid, perfectly close in texture, and impermeable to water; it has, therefore, all the qualifications essential for pump buckets, and is the most durable material of which they can be made. It may be had of all dealers in leather, and of—

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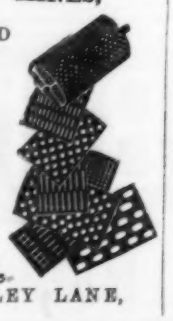

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Crab Winches, Pulley and Snatch Blocks, Screw and Lifting Jacks, Ship Knees, Forgings, and Use Iron of all descriptions

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